

Legacy Systems - Migration and Migration Planning



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ROAR

Outcomes

After today's lecture you will:

- Be able to describe the basic approaches for migrating legacy systems
- Be able to describe the process and activities involved in planning a legacy system migration





Migration

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Migration

- Migration of LIS is the best alternative
 - when wrapping is unsuitable, and
 - redevelopment is not acceptable due to substantial risk
- Very complex process typically lasting 5 - 10 years.
- Benefits:
 - improved system understanding
 - easier maintenance
 - reduced cost
 - more flexibility for future requirements.



Migration

- Migration involves changes, including:
 - restructuring the system
 - enhancing system functionality
 - modifying system attributes.
- Yet it retains the basic system functionality
- LIS migration involves
 - creation of a modern database from the legacy database
 - adaptation of the application program components



Migration

- In general, migration comprises three main steps:
 - ① conversion of the existing schema to a target schema
 - conversion of data
 - conversion of program
 - ② Testing and functionality
 - ③ Cut over (or roll over)



Schema Conversion

- **Schema conversion**

- translating a legacy database schema into an equivalent database structure in a new technology.

- This requires two processes.

- ① **DBRE** - to recover the conceptual schema that express the semantics of the source data
- ② Derive the target physical schema from this conceptual schema:
 - Extract an equivalent logical schema the conceptual schema via transformations
 - Extract a physical schema from the logical schema via transformations.



Data Conversion

- **Data conversion** - transferring data from the legacy database to the target database
- Data conversion requires three steps (ETL):
 - ① **Extract** data from the legacy store
 - ② **Transform** the extracted data so that their structures match the format
 - Perform data cleansing to fix or discard data that do not fit the target database
 - ③ **Load** the transformed data in the target database



Program Conversion

- **Program conversion** - modifying a program to access the migrated database instead of the legacy data.
- While ensuring the LIS functionality is unchanged
- Depends upon the rules used to transform the legacy schema into the target schema.



Testing and Functionality

- We must ensure that the outputs of the target system are consistent with those of the LIS.
- No new functionality should be introduced during migration
- Same functionality = Verifiability.



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In practice, migration projects often add new functionalities (to justify expense)



Cut Over

- **Cutting over** - shifting to the new system from the old one
 - required to cause minimal disruption to the business process
- There are three kinds of transition strategies.
 - **Cut-and-Run:** simply switch off the legacy system and turn on the new system
 - **Phased Interoperability:** gradually cut-over performed in incremental steps
 - **Parallel Operation:** The target system and the LIS operate at the same time
 - Once the new system is considered to be reliable, the LIS is taken off service.



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In practice, a combination of these strategies is used



Migration Planning

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Migration Planning

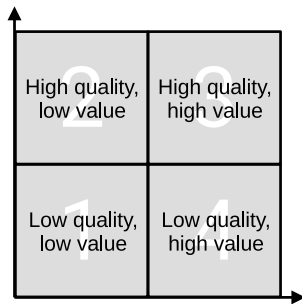
Migration planning comprises 13 steps:

- 1 Perform portfolio analysis
- 2 Identify the stakeholders
- 3 Understand the requirements
- 4 Create a business case
- 5 Make a go or no-go decision
- 6 Understand the LIS
- 7 Understand the target technology
- 8 Evaluate the available technologies
- 9 Define the target architecture
- 10 Define a strategy
- 11 Reconcile the strategy with the needs of the stakeholder
- 12 Determine the resources required
- 13 Evaluate the feasibility of the strategy



1. Perform Portfolio Analysis

- **Portfolio analysis** - establish measures of technical quality and business value for a set of software systems
 - Using identified metrics with min/max thresholds scaled between 0.0 and 1.0
- Represented on a chi-square chart, where
 - **Quadrant 1:** Systems with low technical quality and low business value
 - Candidates for replacement with a commercial product, if one is available.
 - **Quadrant 2:** Systems with high technical quality but low business value
 - Can be left alone
 - **Quadrant 3:** Systems with high technical quality and high business value
 - Candidates for active evolution
 - **Quadrant 4:** Systems with low technical quality but high business value
 - Candidate for redevelopment or migration





2. Identify the stakeholders

- **Stakeholders** - the people or organizations that influence a system's behavior, or those who are impacted by the system.
 - System architects
 - Developers
 - Maintainers
 - Managers
 - Customers
 - End users
- They judge the outcome and impact of the migration project
 - Bring their own perspectives to the table
 - Necessary to obtain their agreement and support



3. Understand the requirements

- **Requirements** - a description of the needs and desires of stakeholders that a system is expected to implement
- There are two challenges in defining requirements.
 - ① ensure that the right requirements are captured.
 - ② express the requirements in such a way that the stakeholders can easily review and confirm their correctness.
- Thus we need to
 - Capture requirements in an unambiguous representation
 - Store this representation in a database
 - Make the database available to stakeholders
- Requirements can come from:
 - Legacy Information System
 - Business Process Reengineering
 - Stakeholders



4. Create a business case

- The business case allows executive management to decide whether the migration project
 - Will increase quality
 - Reduce maintenance costs
 - Be financially viable.
- In general, a good business case provides the following information about the migration project:
 - Problem statement
 - Solution
 - Risks and Benefits.

4. Create a business case

Objective	Sample quantifiable benefit metrics
Lower maintenance cost	Average cycle time to close problem reports Average labor hours to close problem reports Total staff consensus Average problem-report backlog Post-release fix rework hours
Add new functionality	Count of new functions added to the product Value added or revenue generated by new functions
Increase performance	Number of delivered operations, such as transactions, per unit time
Replace old equipment	Net annualized cost of purchase and maintenance
Recode in different languages	Number of modules in each programming language
Reuse of existing artifacts	Number of artifacts used in other products
Data rationalization	Number of redundant database objects removed
Integrate disjoint applications	Number of unified applications accessible to users Measures of usability and training time required for application suite

Business Case in hand

Step 5: Make a go or no-go decision

- It is reviewed by the stakeholders
- If deemed unsatisfactory, the migration project is terminated
- Otherwise,

Step 6. Understand the LIS

- We then work to understand the LIS
 - considered essential to project success
- Techniques available to meet this challenge
 - Program comprehension
 - Reverse engineering.



7. Understand target technology

- Can proceed in **parallel with Step 6**, as we need to understand both
 - The technologies that can be used in the migration effort
 - The technologies that have been used in the legacy system
- In general, four types of technologies are of interest to the migration effort:
 - ① **Languages and DBMS available**
 - ② **Distributed transaction models**
 - distributed communication technologies
 - transaction technologies
 - ③ **Middleware technologies and standards**
 - ④ **Tools that are available to assist in migration of the LIS**

Technology & Architecture

Step 8. Evaluate available technologies

- Compare and contrast available technologies and their capabilities
 - If the capabilities overlap: appraise these technologies for the QoS applicable to the migration process
 - Results inform the architecture and design of the new system

Step 9. Define target architecture

- **Target architecture** - the desired architecture of the new system
 - Models the stakeholders' vision of the new system
 - Should be modeled using different views at different levels of granularity
 - Likely to evolve during the migration process
 - Should be continually reevaluated and updated during the migration process



10. Define a strategy

- **Strategy** - defines the overall process of transforming the LIS to the new system, including:
 - Migration methodology
 - Schema conversion
 - Data conversion
 - Program conversion
 - Testing
- Mission-critical legacy systems deployment tends to be risky
 - It should be evolved incrementally to the new system



10. Define a strategy

- During migration many things can change and must be accommodated for, this includes:
 - user requirements
 - system knowledge
 - technology
- To accommodate these changes, a migration strategy need to:
 - minimize risk
 - minimize development and deployment costs
 - support an aggressive but reliable schedule
 - meet system quality expectations.



11. Reconcile stakeholder needs

- Before implementation stakeholder consensus is needed
 - The strategy then needs to be reconciled to stakeholder's needs
 - Stakeholder's are then briefed on:
 - The approach
 - The target architecture
 - The strategy.
- They evaluates the strategy and provides input for the final consensus profile



12. Determine resources required

- Estimate project resources and cost
 - Can use a variety of estimation approaches, but a good one is COCOMO II
 - COCOMO II addresses:
 - non-sequential process models
 - reengineering work
 - reuse-driven approaches
 - The COCOMO II model provides
 - estimates of effort
 - schedule by phases
 - staffing by phases and activities.



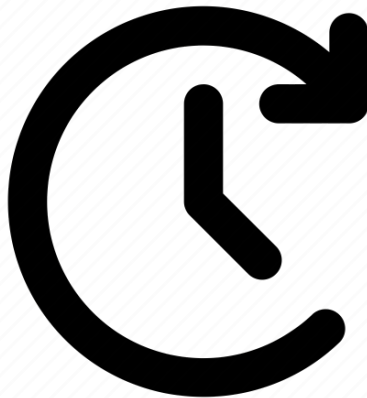
13. Evaluate strategy feasibility

- At this point management should have an understanding of:
 - System under migration
 - Available technology options
 - Target architecture
 - Migration strategy
 - Cost of migration
 - Migration schedule
- Management now determines strategy feasibility
 - If found viable -> the migration plan is finalized
 - Otherwise -> a detailed report is produced, and we can revise until:
 - ① a feasible approach is identified, or
 - ② no feasible approach is identified and the project is terminated



For Next Time

- Review EVO Chapter 5.3 - 5.4
- Read EVO Chapter 5.4 - 5.6
- Watch Lecture 12





Are there any questions?