

# Maintain, Modernize or Migrate?

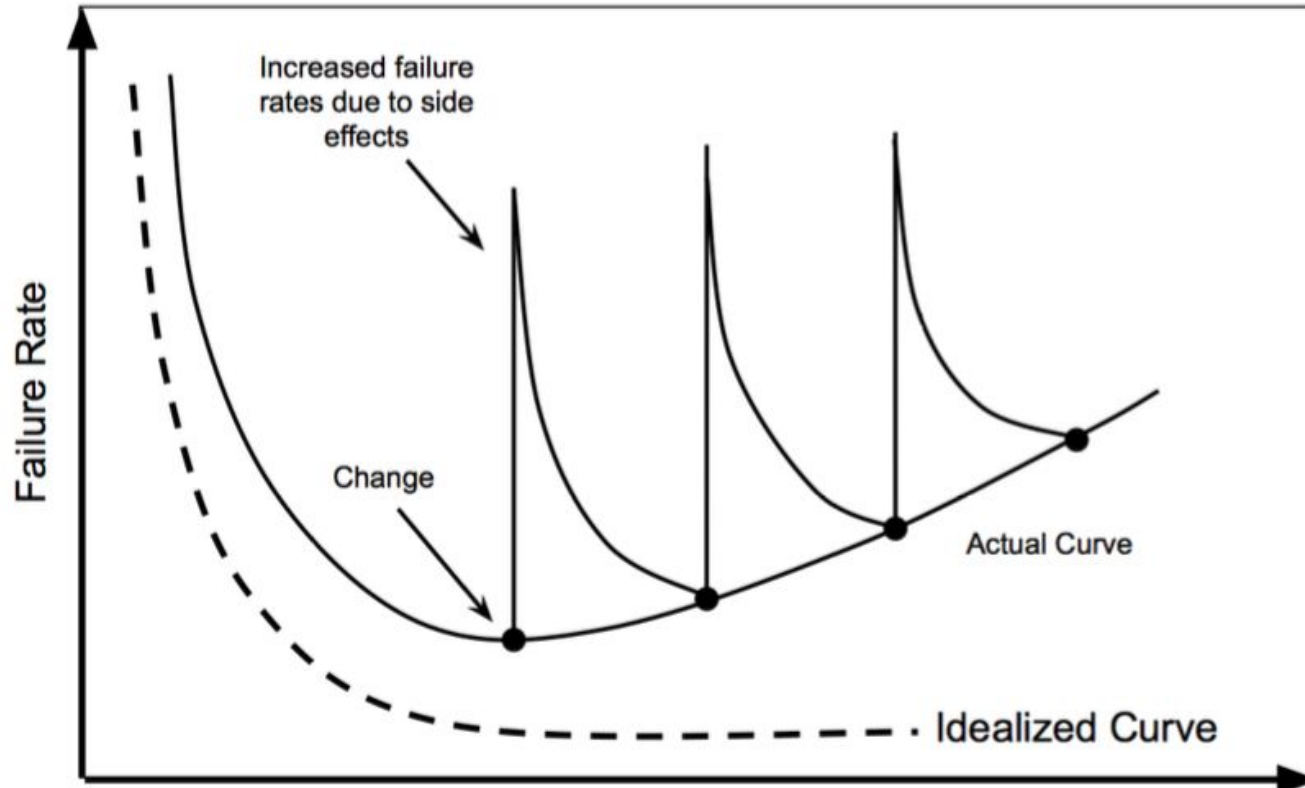
An Iterative Model for Migrating Legacy Systems

Noah Spahn UCSB

# Overview

- Context of Software Maintenance
- Case Study System
- Iterative Model
- Application of the Model
- *Open Discussion*

# Software failure rate over time



Pressman, R. (1994), *Software Engineering, a Practitioner's Approach (European Edition)*, McGraw Hill, New York.

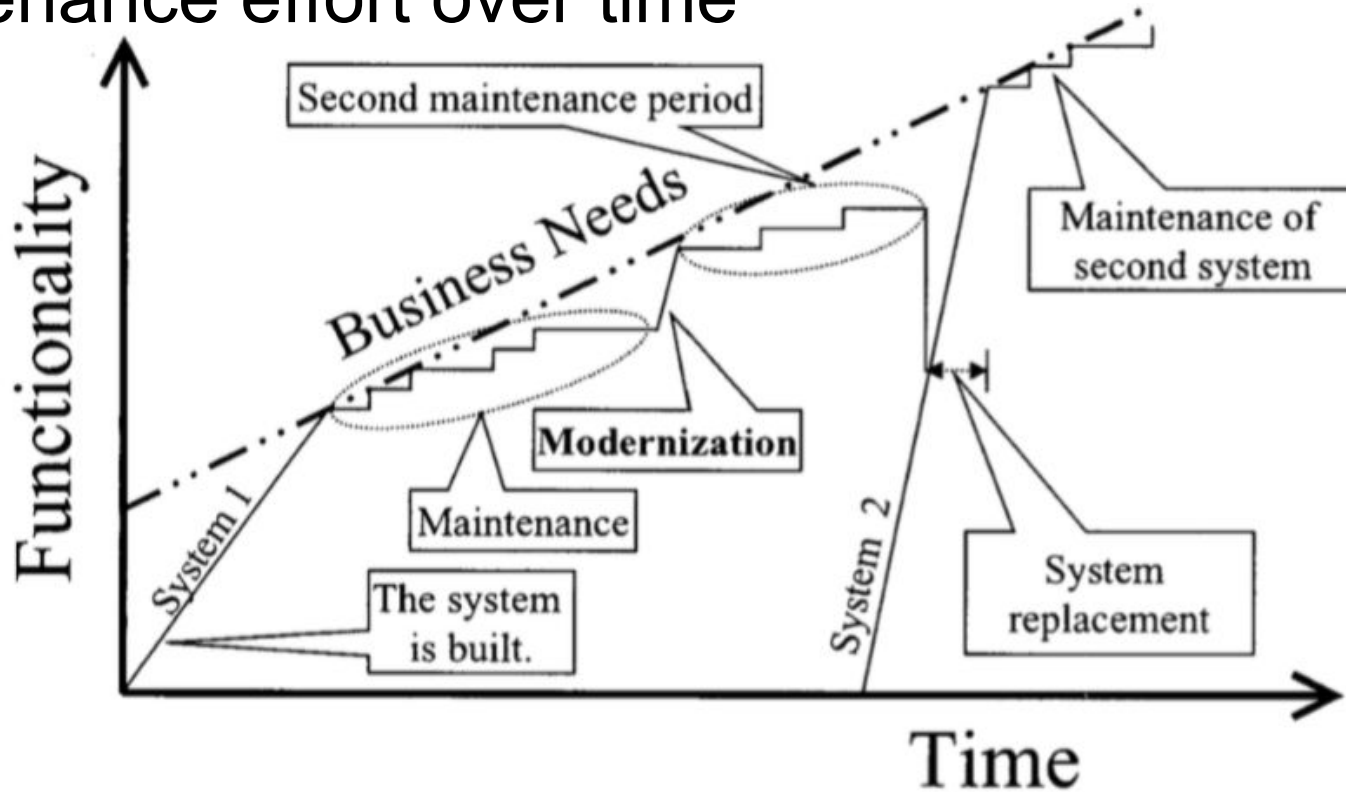
# Maintenance

Enhancing or correcting an existing software system to meet the current requirements.

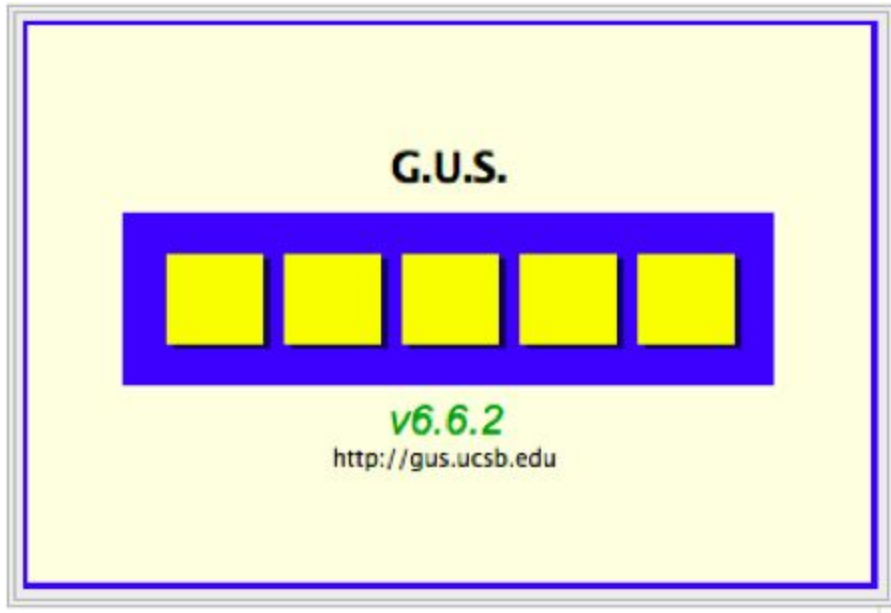
# Development

The first attempt to capture the requirements as a software product.

# Maintenance effort over time



Comella-Dorda, S.; Wallnau, K. C.; Seacord, R. C. & Robert, J. E. (2000),  
A Survey of Black-Box Modernization Approaches for Information Systems., in 'ICSM',  
IEEE Computer Society, , pp. 173-183 .



- When the Chief architect retires...

- UCSB homegrown system
- Developed on a commercial framework
  
- Growing user community
- Actively maintained and modernized
- Successfully adapted to environmental changes
- Oversight committee

# Legacy

(Noun)

A thing handed down by a predecessor

# Legacy

(Adjective)

Denoting software or hardware that has been superseded but is difficult to replace because of its wide use.

“Any systems that cannot be modified to adapt to constantly changing business requirements and their failure can have a serious impact on business”

~Brodie & Stonebraker

"If you don't know where you are, a map won't help."

~Watts Humphrey



<b>Users</b>	<b>Software Engineers</b>	
Happy	Happy	Best situation, everyone is happy.
Happy	<i>Sad</i>	Most precarious, we must keep the users happy whilst enhancing a maintainable system
<i>Sad</i>	Happy	The worst situation. Avoid at all cost
<i>Sad</i>	<i>Sad</i>	2nd best. Anything is better than the current software.

Simplified view of possible legacy situations

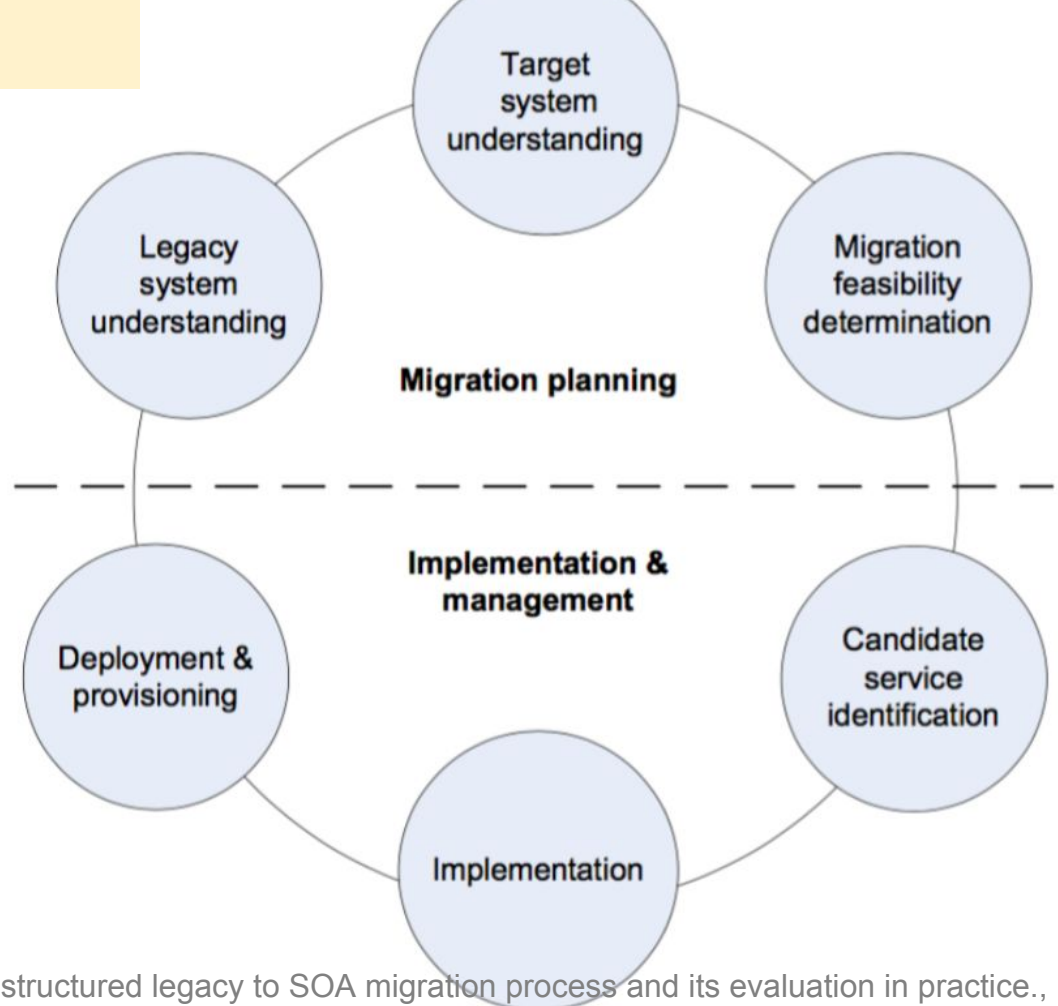
# Prepare for change



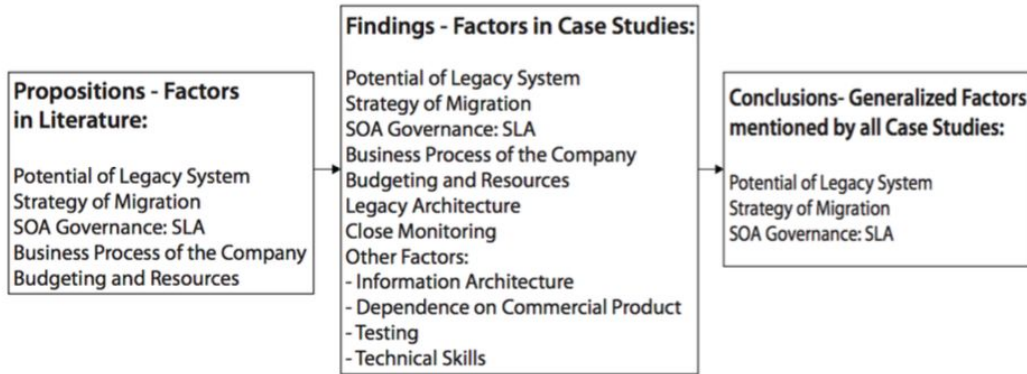
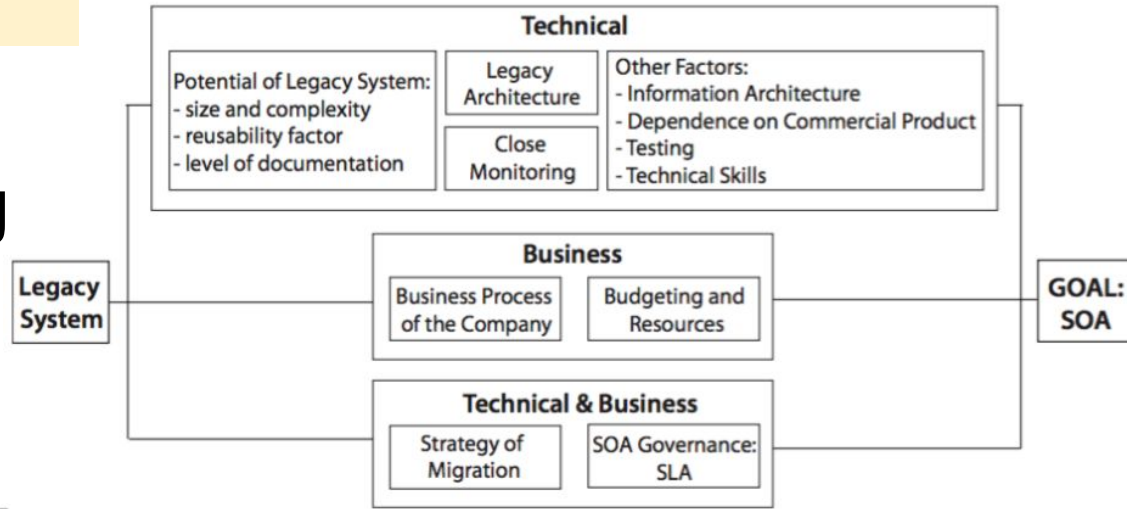
If new levels of upper management have a desire to retire the current system and migrate to a new one...

I had better learn what legacy system migration is all about!

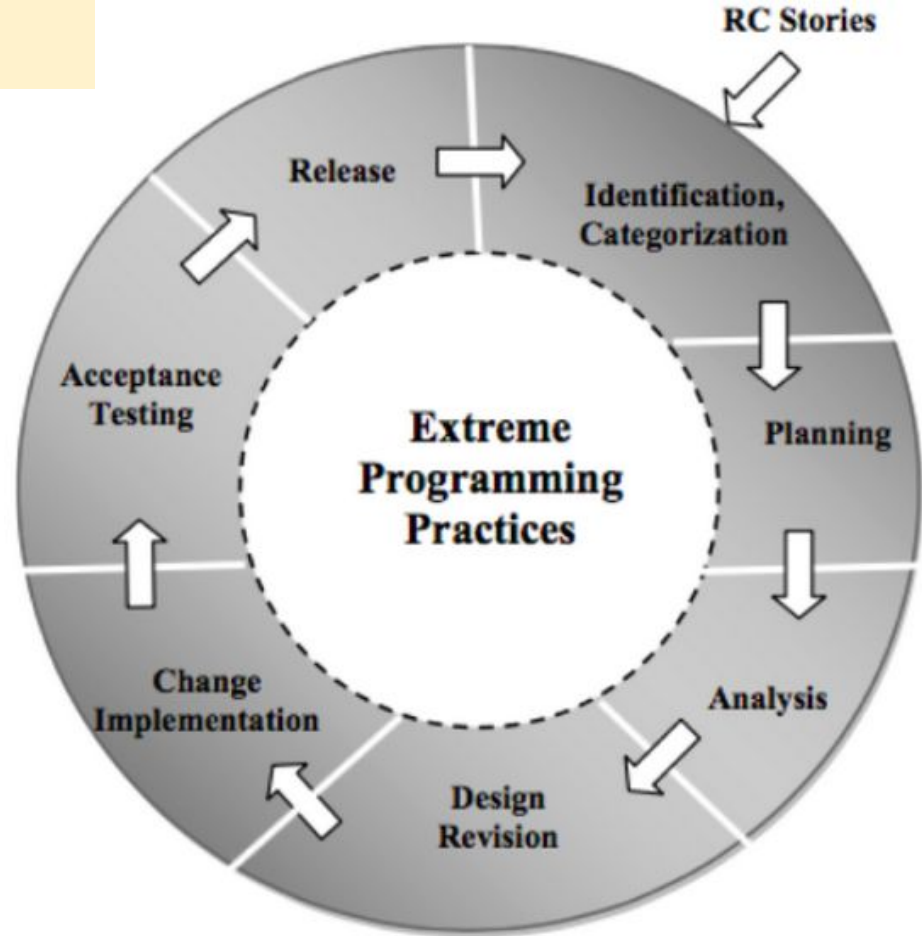
# A structured legacy to SOA migration process and its evaluation in practice



# Success Factors model for migrating legacy systems



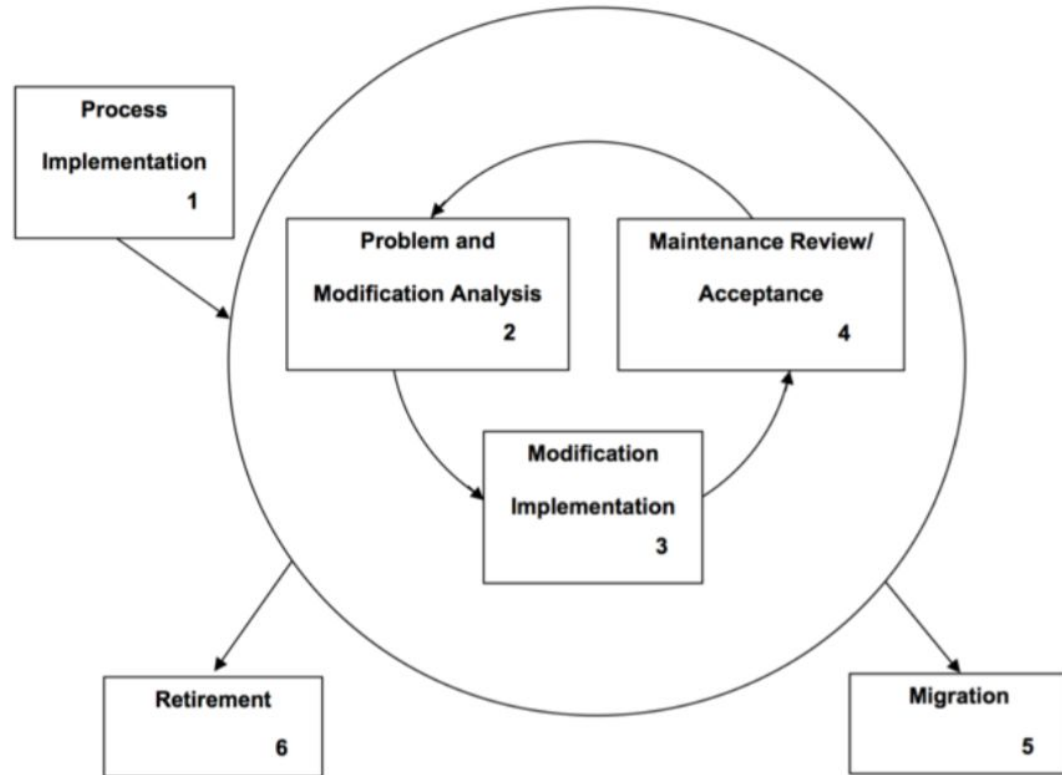
# Extended Iterative Maintenance Lifecycle Using eXtreme Programming



# Maintenance includes Migration

ISO 14764-2006 and other IEEE standards (like ISO/IEC 12207) place migration as a departure from the maintenance cycle...

But in my experience, it should be part of the maintenance cycle.



# The Iterative Model

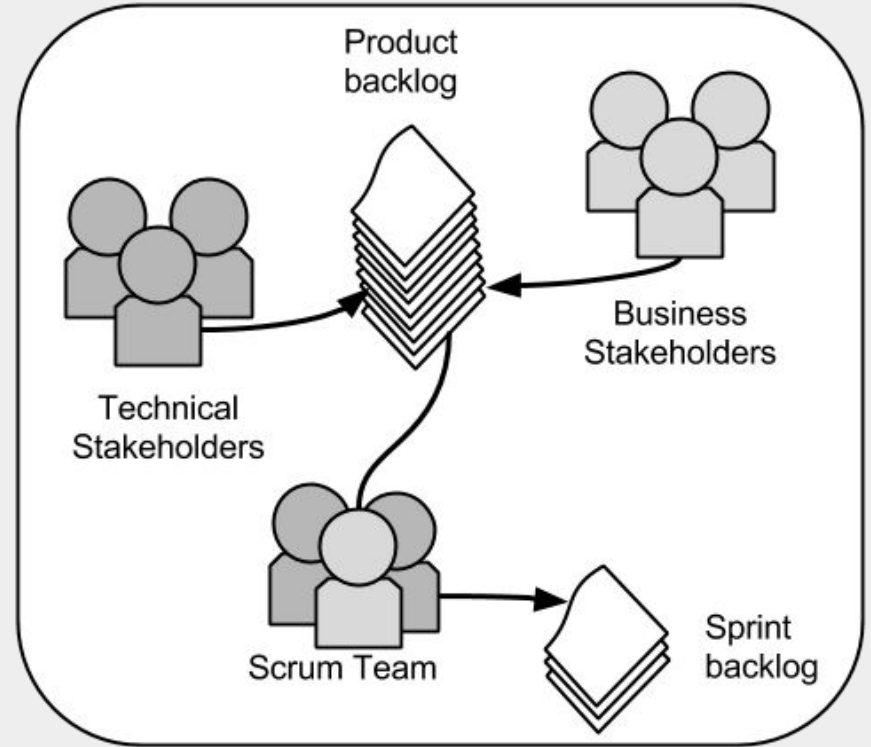
For Migrating Legacy Systems

(in three views)

# Maintenance as RC stories

Looking at the iterative model closely: request for change stories are:

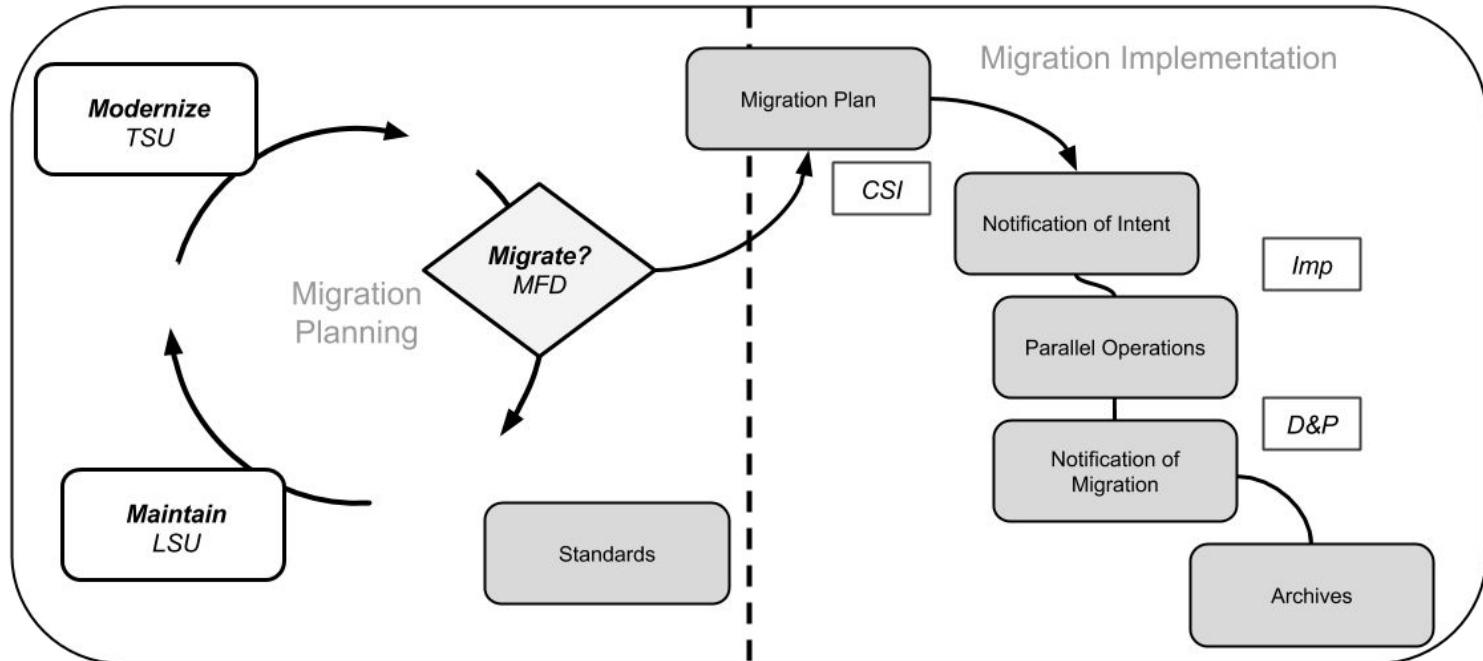
- Prioritized
- Effort-estimated
- Completed in a time-boxed sprint





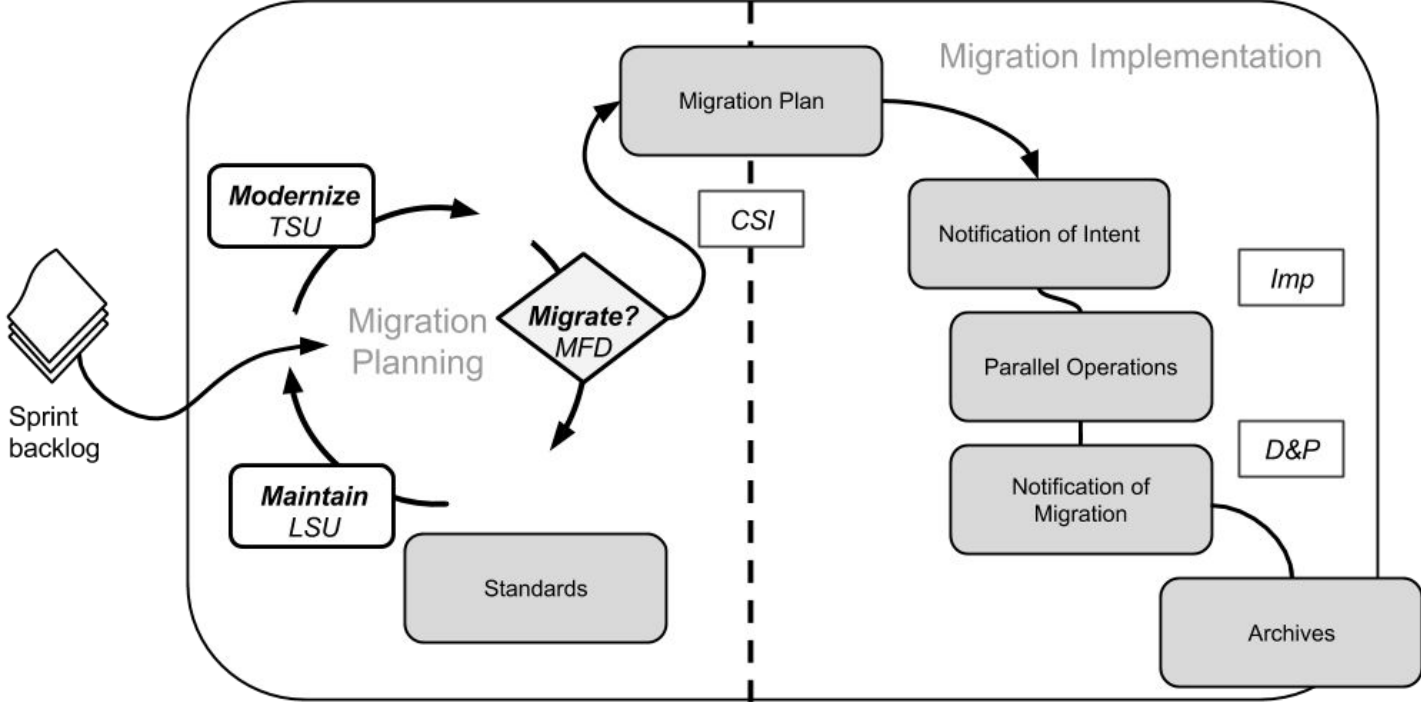
# Migration as a Structured Process

The iterative model looks like a way to categorize maintenance activities into phases of migration.



# Migration as Maintenance

Looking at the big picture, we see the incorporation of migration planning into the cycling of maintenance process



# 3 Key features of the iterative migration model

1. Melding migration into the maintenance cycle
2. Plan for success by incorporating success factors at every phase
3. Scrum practice for maintenance

# Applying the Iterative Model

# Applying the Iterative Model

## Legacy System Understanding

GUS 1.0
Search docs
GUS contacts
Download GUS
FAQ
<b>BUDGET DOCUMENTATION</b>
Projects
Subs
Cost Types
Posting
Reconciliation Process
Carry Forward
Liens
<b>CONTRACTS AND GRANTS</b>
Contracts and Grants
C & G Components
Conditions Codes
<b>PERSONNEL</b>
Employees
Payroll Projection
Payroll Reconciliation
UPAY
<b>RECHARGE DOCUMENTATION</b>
Recharges
Recharge Screens
<b>PURCHASING</b>
Purchasing in GUS on the Web
Equipment
Gateway (SciQuest) Requisition Approvals
Split Funding
<b>GUS ON THE WEB</b>
Web

Docs » Welcome to GUS

## Welcome to GUS

GUS is a custom database system for managing and maintaining funding source, purchasing, lien, and other essential financial information for many departments and research organizations across the UCSB campus.

Managing intramural as well as extramural funding, expense tracking and reconciliation can be very tedious and time consuming. The primary goal of the GUS development team is to simplify these complex and detailed operations while minimizing errors and reducing the frustrations normally associated with these essential tasks.

Since it's inception in 1998, the system's user base has grown from a single research organization to over 50 various units campus-wide.

The five major modules within GUS are:

- **Budget** - provide insight into the core of how GUS helps with financial management (based on the idea of management by Projects)
- **Contracts and Grants** is the starting point for many of the funds that are managed by organizational research units
- **Personnel** - payroll and payroll projections
- **Recharges** - tracks and manages departmental recharges and generates the Financial Journal
- **Purchasing** - on the web or using the equipment module from the 4D client

GUS is intended to improve data access, ease data entry, reduce duplicated data entry and data entry errors and provide automated assistance for common functions:

- monthly reports
- monthly reconciliations with the campus ledger
- communication with clients
- report production
- carry forward
- annual reports
- statistics collection


## Thinking about GUS?

The GUS Executive Committee receives inquiries from departments/units that are interested in adopting GUS.

There are many things to think about as you contemplate switching to GUS. As a manager, you need to do considerable advanced planning to determine whether GUS is right for your unit. For example, GUS is project-code driven. If you do not currently track your finances this way, this is a major change. Is your unit research-intensive? Do you have a staff member who used GUS in a previous position that you consider a "power" user?

# Applying the Iterative Model

## Target System Understanding

 **systems**  
Systems log (and possibly alert) here

Backup-logging	1:31 AM	ERI_zfr-recharge
Backup-logging	1:31 AM	Bren
Backup-logging	1:31 AM	Film
Backup-logging	1:32 AM	NRI
Backup-logging	1:32 AM	IHC
Backup-logging	1:32 AM	Theater_and_Dance
Backup-logging	1:32 AM	Music
Backup-logging	1:32 AM	PMO
Backup-logging	1:32 AM	FARM
Backup-logging	1:32 AM	FAIL CHECK--23
Backup-logging	1:32 AM	LSAA
Backup-logging	1:32 AM	

</> backups

ACTIONS

- Clone
- Create branch
- Create pull request
- Compare
- Fork

NAVIGATION

- Overview
- Source
- Commits
- Branches
- Pull requests
- Issues
- Wiki
- Downloads
- Settings

Overview

Last updated	2016-06-22	1 Branch	0 Tags
Language	Shell		
Access level	Admin (revoke)	0 Forks	2 Watchers

[Edit README](#)

The current plan is to run this script as a cron job from `gus-util` twice a day. The first time it runs will be a full backup and the second time will be an incremental. This script will be run from `gus-util.gus.ucsb.edu` and each month will step on the backup from the previous month, but by doing so we will have one month's worth of backups at any point in time without the need to coordinate the timing of cron scripts between servers (one to do the backups and one on the server to organize the backups).

The directory structure of the backups (as they exist on the backup server which is currently `citrus.eri.ucsb.edu`) is as follows:

```
01/
01/comm
01/envstudies
01/eri
01/feminst
01/film
01/gisp
01/inc
01/lsaa
01/tsac
01/tssc
01/music
01/nri
01/sociology
01/theater
02/
02/comm
02/envstudies
02/eri
...
...
```

Where each department is backed up into a department sub-folder of the current day of the month (with leading zeros).

---

### backup.sh

This script is meant to serve the utility of rsync backups for the critical components on the server. It makes the *assumption* that **ssh key authentication** has been set up on the machine that is running the script.

### backupwrapper.sh

This script wraps the `backup.sh` script, giving us the ability to output to a logfile and to post messages to hipchat.

### crontab.txt

sample of the `gus_admin` user's crontab entry

### utils.sh

Defines the methods that are used to perform the backups and log messages to hipchat. If there is any problem with a backup (exiting with non-zero status), the hipchat message will be posted with an 'alert status' and display the error code.

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## Backup & Restore

### Backup

# Applying the Iterative Model

## Migration Feasibility Determination

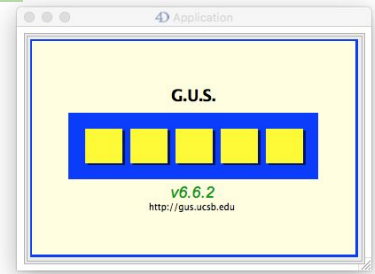
gus  
Sprint 24

QUICK FILTERS: Only My Issues Recently Updated

To Do	In Progress	Blocked	Review	Done
▼ Documentation 1.0 1 issue				
				<div><p><b>GUS-266</b></p><p>↑ Get 404 error on a nested page to link to css/js resources</p><p>Documentation 1.0</p><p>None</p><p>3</p></div>
▼ Defect 2 issues				
		<div><p><b>GUS-108</b></p><p>↑ Track down 'direct to printer' issues</p><p>Defect</p><p>Find any PRINT SELECTION commands that a</p><p>3</p></div>		<div><p><b>GUS-277</b></p><p>↑ Backup reports don't support the display of volunteer time</p><p>Defect</p><p>There is a need to give departments a report th</p><p>1</p></div>
▼ v15 1 issue				
	<div><p><b>GUS-269</b></p><p>↑ begin chipping away GUS Compile -&gt; Check Syntax errors</p><p>v15</p><p>None</p><p>5</p></div>			
▼ Gus Central 2 issues				
<div><p><b>GUS-276</b></p><p>↑ Baseline requirements</p><p>Gus Central</p><p>What are the minimum requirements to replicat</p><p>1</p></div>				<div><p><b>GUS-275</b></p><p>↑ document system</p><p>Gus Central</p><p>In order to understand the current system, we n</p><p>2</p></div>
▼ Issues without epics 5 issues				
<div><p><b>GUS-245</b></p><p>↑ newly added Pis in Projects should default to get standard reports</p><p>Requested By Lynne Pritchard:</p><p>2</p></div>	<div><p><b>GUS-288</b></p><p>↑ test resource folder without the use of RSR</p><p>No RSR file, just a Resource folder within the m</p><p>5</p></div>	<div><p><b>GUS-290</b></p><p>↑ Intake Geology host into our managed stack</p><p>Set up key-sharing on the</p><p>3</p></div>		<div><p><b>GUS-272</b></p><p>↑ hide employee DOB field</p><p>DOB is PII data and GUS isn't currently compli</p><p>1</p></div> <div><p><b>GUS-279</b></p><p>↑ Follow up with Jackie Spier about bug she reported</p><p>There were 2 options discussed:</p><p>1</p></div>

# Applying the Iterative Model

## Component System Integration



Travel Vouchers: 464 of 464

Quick Searches

Project Code  FY  Status

Voucher Id  Trip Id  Traveler

Caution: Travel Advances are not posted.  
Gen Search  Show All

Voucher Id	Trip Id	Traveler	Proj(s)	CostType...	Purpose	Start Loc	Destination	Start Date	
263849	TAGU263849	Christina L Tague	TCF02, TCPI	DOM	Presentation in Eco-hy	Newark, NJ	Toronto, Onta	6/19/16	onRequestRow
263841	BRAN263841	William Ty Brandt	DJN12	DOM	Workshop for NASAs A	Santa Barba	Pasadena, Ca	6/27/16	onRequestRow
263840	SAMP263840	Sarah R. Sampson	LHF03	DOM	Field Research - docur	Goleta, Ca.	San Diego, Ci	6/16/16	onRequestRow
263785	BAIR263785	Edward Bair	DJC01, DJN	DOM, TRV	1st Airborne Snow Ob	Mammoth La	Pasadena, Ca	6/27/16	onRequestRow
263519	MARI263519	Stephane Maritorer	MS1P01	DOM	NASA CORAL Project -	Goleta, Ca.	Honolulu, HI.	6/8/16	onRequestRow
263294	GUIL263294	Nathalie Guillochea	SDN36	DOM	Plumes and Blooms re	Santa Barba	Santa Barba	6/23/16	onRequestRow
263189	STRA263189	Elisa Claire Strattor	25ONB	SUP	Meeting with agency r	Santa Barba	Sacramento,	6/1/16	onRequestRow
263104	VALO263104	Anne Marie Valovci	TTF01	DOM	IRIS Workshop 2016	Goleta, Ca.	Vancouver, W	6/7/16	onRequestRow
263086	MELA263086	John M Melack	MJP07	TRV	To attend the ASLO m	Santa Barba	Santa Fe, NM	6/7/16	onRequestDone
263032	MCCU263032	Ian M McCullough	DFF03	TRV	Field work for Frank D	Goleta, Ca.	Lebec, Ca. (Ti	5/27/16	disconnected
262999	DOZI262999	Jeffrey C Dozier	DJN13	TRV	Meeting		China	8/2/16	connected
262810	HEGA262810	Paul Anthony Hegar	SJ1G01	DOM	Equipment maintenanc	Santa Barba	Brawley, Ca.	6/7/16	onRequestColumnMetadata
262808	HEGA262808	Paul Anthony Hegar	SJ1G01	DOM	Cooling maintenance	Santa Barba	Borrego Sprin	6/3/16	onRequestDone
262791	DAVI262791	Frank W Davis	DFF03	TRV	Download data sensor	Santa Barba	Lebec, Ca. (Ti	5/21/16	disconnected
262625	DAVI262625	Frank W Davis	DFF03	TRV	Data downloads at 4 s	Santa Barba	Lebec & San.	5/27/16	connected
262461	DAVI262461	Frank W Davis	DFF03	TRV	Download data sensor	Santa Barba	Lebec, Ca. (Ti	5/21/16	onRequestDone
262458	TWAR262458	Cedric Twardzik	300AR	TRV	2016 SSA Meeting	Santa Barba	Reno, NV.	4/19/16	disconnected
262455	DOZI262455	Jeffrey C Dozier	DJN11	TRV	Attend CCST (Californ	Mammoth La	Livermore, Ca	5/25/16	onRequestColumnMetadata
262416	SING262416	Michael D Singer	SFM02	TRV	EGU Conference	St. Andrews,	Vienna, Austr	4/17/16	onRequestDone
262365	SILV262365	Thiago S F Silva	HLP02	DOM	Meeting		Santa Barba	7/18/16	disconnected
262298	HARR262298	Christopher Harron	300AR	TRV	SSA 2016 Annual Mee	Santa Barba	Reno, NV.	4/19/16	connected
262259	DESO262259	Rodrigo Nunes De S	HLP02	DOM	Meeting		Los Angeles,	7/18/16	onRequestColumnMetadata
262258	DESO262258	Rodrigo Nunes De S	HLP02	DOM	Meeting		Los Angeles,	7/18/16	onRequestDone
262165	SILV262165	Thiago S F Silva	HLP02	FOR	Field work		Mamiraua, Br	7/1/16	onRequestRow
262164	SILV262165	Thiago S F Silva	HLP02	FOR	Field work	Santa Barba	Mamiraua, Br	7/1/16	onRequestRow

Download Running Stop Restart



The end.

Thank you.