

# Managing Enrollment Policies for Insurance Plans

## OOPSLA 2001 DesignFest Problem

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### Abstract

This DesignFest problem from the insurance industry is based on an existing system to provide flexible insurance coverage packages. Insurance companies sell these packages to other companies as an economical way for them to provide insurance as an employee benefit, where the insurance is tailored to the employee's personal circumstances. Employees only pay for the coverage they need. An employee who already has dental insurance through their spouse can spend their money on other types of insurance instead. The actual choices an employee can make depend on the specific rules their employer negotiates with the insurance company, and the system to be designed is intended to enforce these rules.

### Prologue

BOSS: I want to develop a new system for enforcing the policies of the insurance plans for our customers.

YOU: Hey, great idea man. I love designing cool, new stuff!

BOSS: This new system has to control when participants can make changes to their selections for the different benefits in their plan. Like when a guy gets married, he's allowed to change his medical and dental coverage to include his new wife. And when someone changes from part time to full time they can change their life insurance coverage but not the medical and dental coverage.

YOU: Sounds complicated. Do you have all those business rules documented?

BOSS: Most of them are standardized in our policy documents, but some of them are customer specific. Also, you probably know from working here so long that the participants are allocated a variable amount of money each year, our customers call them "flex credits", and that some types of coverage can be paid with credits, but others must be paid using payroll deductions.

YOU: Yeah, also I remember there are a maximum of nine types of coverage and each plan for a customer is a unique combination of those. So, when do you want this? And what sort of interfaces do we need.

BOSS: We want to have a Web interface for the participants by the end of the next quarter (that's in 4 months ;-). The Web front end is for participants to make the selections and the GUI Group will be building that, so you'll need to coordinate with them, but I want the business rules and policies to be a re-usable engine. Also, the information about the participants, like marital status, employment status, and such, will be provided by our customers through XML streams. And we have to send to our underwriting group the details about the selections, also with XML.

YOU: Hmm, OK. Let's get started. I think we should meet tomorrow with all the stakeholders to round out the details of these requirements, and start making a project plan and architecture plan.

BOSS: Good idea. I'll get it all arranged. See you tomorrow at 1:00pm in the War Room.

## Domain Description

Insurance companies provide many types of insurance coverage to a wide range of customers. For ABC Assurance, the insurance company modeled in this DesignFest problem, the types of insurance coverage are:

1. Long Term Disability Protection (LTDP)
2. Medical Coverage (MED)
3. Dental coverage (DEN)
4. Survivor Medical and Dental (SURV)
5. Life Insurance (LIF)
6. Spousal Life Insurance (SLF)
7. Dependant Life Insurance (DLF)
8. Accidental Death and Dismemberment (ADD)

For each type of insurance coverage a participant, which is an employee of a customer to ABC Assurance, can choose different levels of coverage. For example, Medical Coverage might have three levels of coverage, Low, Medium and High.

ABC Assurance has a customer, the Bank, which has hired ABC to provide six of the eight types of insurance coverage for all their employees. The Bank has asked ABC to apply certain rules that would allow employees to make changes to their choices only at certain times and within 60 days of the event. The following table shows the business rules:

Work/Life Event	LTDP	MED	DEN	LIF	SLF	DLF
Regular to Temporary	N	Y	Y	Y	Y	Y
Temporary to Regular	Y	Y	Y	Y	Y	Y
Change in marital status	N	Y	Y	Y	Y	Y
Add or Remove dependent	N	Y	Y	Y	Y	Y
Go on Maternity or Child Care Leave	N	N	N	Y	Y	Y
Return from Maternity of Child Care Leave	N	N	N	Y	Y	Y
Go on Illness Leave	N	1	1	1	1	1
Return from Illness Leave	N	N	N	Y	Y	Y

Y. Participant can change this benefit in any way.

N. Participant may not change this benefit.

1. Participant can only decrease coverage for the specified benefit.

The Bank plans to notify ABC about work and life events by making available on a weekly basis an XML feed for any participant with changes in their information.

The Bank also wants ABC to ensure that LTDP is paid with credits only, LIF, SLF and DLF must be paid with payroll deductions, and MED and DEN can be paid with either

credits or deductions. If a participant uses up all their credits they may pay for MED and DEN with a combination.

Benefit Plan	Payment Options
LTDP	Credits
MED	Credits or payroll deductions
DEN	Credits or payroll deductions
LIF	Payroll deductions
SLF	Payroll deductions
DLF	Payroll deductions

### Options and Costs of Benefits

ABC has negotiated with the Bank the following options and costs per option for each type of insurance benefit.

Long Term Disability Protection	
50% of salary	\$400 per year
70% of salary	\$500 per year
70% of salary plus 3% indexing	\$525 per year

Medical	
Low	\$235 per year
Medium	\$285 per year
High	\$350 per year

Dental	
Low	\$180 per year
High	\$300 per year

Employee Life				
Age Group	Male – Smoker	Male – Non-smoker	Female - Smoker	Female – Non-smoker
0-25	\$1.15	\$.85	\$1.10	\$.75
25-45	\$1.30	\$1.00	\$1.25	\$.90
45-70	\$1.45	\$1.20	\$1.40	\$1.10
Prices are per \$1000 of coverage. Participant may select multiples of \$20,000 in coverage, up to a maximum of \$1,000,000.				

Spousal Life				
Age Group	Male – Smoker	Male – Non-smoker	Female - Smoker	Female – Non-smoker
0-25	\$1.15	\$.85	\$1.10	\$.75

Spousal Life				
Age Group	Male – Smoker	Male – Non-smoker	Female - Smoker	Female – Non-smoker
26-45	\$1.30	\$1.00	\$1.25	\$.90
Over 45	\$1.45	\$1.20	\$1.40	\$1.10

Prices are per \$1000 of coverage. Participant may select multiples of \$10,000 in coverage, from \$10,000 to a maximum of \$300,000.

Dependent Life	
\$10,000	\$12.00 per year
\$15,000	\$16.00 per year
\$25,000	\$24.00 per year

## The Required Program

Your job at DesignFest is to design a program that enforces the business rules for the employees of the customer (the participants). This program must ensure that a participant pays using the correct method, and that the participant is restricted from making changes to benefit choices as per the rules above.

Your design should include the ability to receive on a weekly basis the XML stream of work or life events. Designing the DTD for the XML stream is beyond the scope of the problem.

A significant part of the design problem is to create an interface by which the User Interface tier may query a component about the restrictions for a participant, and the cost of a particular option of a benefit.

The business rules described above are just one example for a typical customer of ABC. Other customers of ABC may have different work or life events, a different set of insurance benefit plans, and different restrictions for a work or life event. The program you design should be flexible to handle many customer choices.

## Actors

This problem has two actors:

1. the customer who sends XML streams; and
2. a participant (employee of the customer) who makes particular selections.

## Use Cases

1. Customer sends an XML stream with events and participant data. The system must update the participant data, and record the event in some way so that the business rules are applied when a participant tries to access the system (see use cases below and the work/life event table in the Domain Description section).
2. Customer sends an XML stream that includes an event for a participant with an already active event. The system must update the participant data, and record the event as in use case #1. The participant with the already active event has X days still available to make selections. This participant should now have 60 days

- to act on either event. Also, for each benefit, the most flexible access to a benefit is applied; the order of arrival of events is irrelevant. For example,
- a. Event A allows access and event B denies access, then allow access (and vice versa)
  - b. Event A allows access and event B allows decreases, then allow access (and vice versa)
  - c. Event A allows decreases and event B denies access, then allow decreases (and vice versa)
3. Participant changes the selection for a benefit where allowed access to that benefit.
  4. Participant saves good selections.
  5. Participant tries to change the selection for a benefit where not allowed access to that benefit. The system should either not allow access at all, or return an error message. (The DesignFest team is encouraged to have someone play the role of being on the GUI Design team to come up with a good design choice here, and for #6 and #7 too.)
  6. Participant tries to save selections after an error has occurred. If the participant has selections that would still cause an error, then the system should not allow the selections to be saved.
  7. Participant tries to change the selection for a benefit but is denied access because there is no active event. The system should either not allow access at all, or return an error message.
  8. Participant decreases a benefit selection where allowed.
  9. Participant tries to increase a benefit where only decreases are allowed. The system should return an error message.
  10. Participant selects an option for a benefit that must be paid by credits but the participant does not have enough credits. The system should return an error.

Use cases #1 through #9 assume that the participant always had enough credits. Other use cases similar to #10 are left to the DesignFest team to generate if there is sufficient time.

## Test Cases

The following test cases should be considered in order, and are date specific:

Day 0:

1. Receive an XML stream from the Bank with the following events:
  - a. ID 9392, Regular to Temporary
  - b. ID 3828, Add a dependent
  - c. ID 2929, Change in Marital status

Day 5:

2. ID 9392 makes selections.
3. ID 3828 makes selections.

Day 45:

4. Receive an XML stream with the following events:
  - a. ID 9392, Change in Marital status
  - b. ID 2936, Go on Illness Leave
  - c. ID 6457, Return from Maternity Leave
  - d. ID 3828, Go on Child Care Leave

Day 50:

5. ID 3828 makes selections.
6. ID 9392 makes selections.
7. ID 2929 makes selections (has 10 days left).

Day 65:

8. Receive an XML stream with the following events:
  - a. ID 2936, Return from Illness Leave

Day 70:

9. ID 2936 makes selections.
10. ID 6457 makes selections (should fail because beyond 60 days)

## Interfaces

Receive an XML stream with work or life events for an employee.

Respond to API request from GUI to apply business rules.

## Change Cases

1. Consider the changes required if a new work or life event is added.
2. Consider the changes required if ABC adds a new benefit plan.
3. Consider the changes required if, for a work or life event, the allowed changes for a benefit plan were more complicated. For example, suppose that in some cases
  - a. only increases were allowed, or
  - b. the level may not be changed but the benefit may be declined.
4. Enhance the design so that there are maximum levels of coverage for a benefit. A participant may choose to exceed the maximum if they provide evidence of insurability (EOI). At the time of using the interface for making selections, the participant should be advised of the maximum and the request left as "pending". Once the EOI has been received by ABC and approved, only then may the benefit be increased to the requested level. Note that this change adds a new actor (someone to approve or deny requests), and new use-cases.

## References

None