Cornell

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Work Product - Digital Innovator, Accounting

Harpreet Athwal <ha227@cornell.edu>   Fri, Jun 15, 2018 at 2:08 PM
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HI Dan, All,

Checking in - I secured an appointment for presenting this work product on 6/19. After getting started late this week, I wanted to check in on what I have done so far over the last 2 days and get some feedback.

1. Assumptions on Product Deliverables - *I am planning on Delivering a prototype of a working accounting interface (web page with form input and db on the backend). The web form will allow me to create a **Bill** composed of multiple **Line Items** and allocate the cost of each **Line Item** based on a **Model**. A **Model** simply is a probability mass function that is used to distribute percentage costs across entities based on some intelligent allocation strategy e.g. based on usage patterns across entities. This product will allow accountants to transfer an abstract invoice to a concrete database billing object with an allocation model applied. We will assume a batch job leverages the Roivant Ledger API to update accounts based on billing data at EOD.*
2. Assumptions on Modeling Deliverables & Project Goals - *I put all my thinking highlighted yellow inline below. Different modeling philosophies are explained and this will be elucidated later with concrete example models/KPIs. Please let me know if you have any feedback!*
3. Tentative Prototype - *Please check out welovedentists.net ! This is being polished and a backend is being built today and tomorrow.*
4. Assumptions on Presentation - *I am preparing to demo for 1 hour on Tuesday and assuming the rest of the time is set aside for interviews/chats.*

I put a lot of notes below, but I really just want feedback of the high level 4 bullets above. Please do not hesitate to critique my approach, I have the weekend to myself to work on this!
Much appreciated,
Harp

<u>*Example:*</u> $2500 **Bill**   ---> $1000, $1500 **Line Items** using **Models** A, B   ---->   Ledger Entry for each Entity

*$2500 Cloud Server **Invoice** can be allocated as a $2500 **Bill** split evenly across entities 1-10 using a **Model** like [0.1, 0.1, 0.1, 0.1, 0.1, 0.1, 0.1, 0.1, 0.1, 0.1] or can be allocated entirely to entities 1 & 3 using a **Model** like [0.4,0,0.6,0,0,0,0,0,0,0]. We can even break the $2500 **Bill** into 2 **Line Items** where $1000 is allocated according to **model** 1 and $1500 **Line Item** is allocated according to model 2.*

----------------------------- Front End Prototype: -----------------------------

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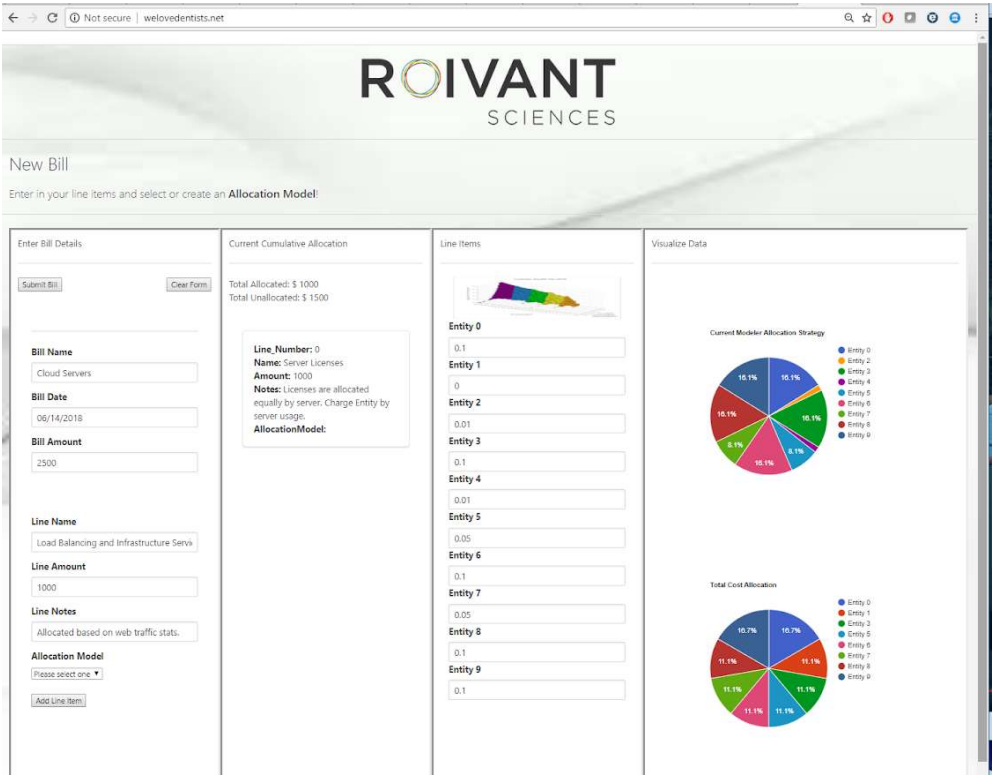
------------------ **Original Email with highlighted Notes!:** ------------------

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Background

Roivant provides IT services to our **five** operating subsidiaries. Many of these services are in the form of third party capabilities that are purchased by Roivant. We receive pdf invoices on a periodic basis (usually monthly) from these vendors for the aggregate cost of the services. We want to accurately allocate these costs to Roivant and the subsidiaries.

Examples of these services and costs include

- SaaS apps purchased on a per user basis

    - Allocation Strategy: Based on number of users in Entity

    - SUBSIDIARY COST = (TOTAL PRODUCT COST) / (# USERS IN SUBSIDARY)

- Shared cloud servers purchased on a per server basis that are used by multiple companies

    - Allocation Strategy: Based on Usage per Entity as determined by some model.

        - Direct Spend Weighting of Shared Expenses – This allocation strategy weighs shared expenses as a portion of overall IT spend. It's a surrogate metric for cost savings by entity essentially.

        - Manually Weighted - An IT staffer enters in raw score in the form of pie slices and delivers a report to the team. This could be a holistic number informed by an automated report. The automated report could be built on the previoudly mentioned 'direct weighting' allocation strategy.

- Lump sum implementation costs for software that will be used by multiple companies

    - Conduct a survey and assign the best book value you can to the comparative overall future usefulness the software will have for each company. While we don't expect companies to want to voluntarily bear additional cost burden for finding innovative uses for software, we do not want to disproportionately punish those who readily found the software valuable and argued for its implementation. A fair compromise is to charge each company based on the best guess as to who will use it and how much they will use it to save on operational costs. If there are fixed one-time costs, and staggered timelines for when entities will use the software, split up the costs according to who will get the most use of the software over some time horizon e.g. next 5-years.

- Fixed cost data purchase, different parts of which will be used by different companies

    - Assign best book value you can to different parts and allocate those costs appropriately to the respective companies

- Item (e.g. printers) purchases that are used by one company

    - Directly allocate all to the particular entity. I am not considering how to apply accounting practices like depreciating costs here. If more granular accounting is needed estimate usage patterns within the departments of that entity.

Our goals are to

- Empower the operating companies to accurately manage their costs

    - This is accomplished by transparency and feedback loops for all data. This means, data and models should be accessible by accountant and each entity. Publishing reports based on billing data and conducting surveys to better inform allocation strategy models will create visibility into cost accounting.

- Fully allocate costs between Roivant and the subsidiaries

    - Conservative Accounting can discourage innovation but it is still the most reasonable approach. Things like this can easily be mediated by a model owner. e.g. the model owner can attribute any line items in any way, so they could decide to allocate costs based on future expected usage of a particular software product if they wanted to.

- https://pdfs.semanticscholar.org/6d95/53fde7bac3d09fd11f00308c895d17cc15e2.pdf
- Provide transparency
    - Conduct surveys and report on data with a dashboard to show allocation models
    - Use a process that records everything with a timestamp and doesn't require deleting any data.
    - Batch jobs update ledger and mark database record of bill as sent.
- Avoid complexity
    - Allow for simple user input and simple user edits. Simple, single page, web interface.
    - Nightly batch jobs ensure that only the latest stated data of the data is pushed to ledger and allows easy midday restatements. This process can be extended to support restatements within the ledger if the API supports this.

A variety of allocation methodologies can be used to fully achieve these goals, including

- Proportional to service usage
- Pass through per unit or per user
- Others that achieve the above goals

Work Product

Design a system that automates the process from new invoice→how the subsidiaries will be charged for utilizing the Roivant IT services→how the ledger will be updated, considering:

- What data would be required and how you might source it
    - Survey Data - Deciding how to model cost allocation should be collaborative
    - Usage Data - Usage patterns can be automatically converted to allocation models with simple math e.g. turn server usage report into a Probability Mass Function across the entities.
    - IT Budget Data - Use current IT budget as a surrogate measurement of IT cost savings for some lump sum expenditures.
    - Invoice Amounts - Need structured input of actual invoice data. Assuming data comes in unstructured, the best naïve process for handling them is data entry. Automatic processing of unstructured -> structured data can be built after once we know expected input file formats.
- How new users, data, software, and licenses would be addressed
    - Each database object allows for restatement of data. Each row has a timestamp and for each period we can consider the latest timestamp.
- Proposed allocation structures
    - See above
- Explicit calculation methodologies for the different allocation structures

- o Example to be provided separately
- How the system could be integrated with a standard ledger software
  - o Assume there is a documented POST / GET API to the ledger
    - Example DB to be provided with explanation of how to batch update a ledger with same data.

Build a prototype of some part of the system. (You can create fake data if necessary).

Check out welovedentists.net

I am continuing to build this out and plug it into a postgres DB with mild backend data validation (front end validation is minimal as well right now)

---------------------------- **Back End Prototype:** ----------------------------
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Bills					
Table	**Column**	**DataType**	**Description**	**Nullable**	**Default**
Bills	bill_name	VARCHAR 250	Name of Bill	FALSE	""
Bills	bill_date	DATE	Bill Date (Posting date if bill date is missing)	FALSE	0
Bills	bill_amount	NUMERIC (10,2)	Total Bill Cost	FALSE	0
Bills	line_number	VARCHAR 100	Line Number	FALSE	0
Bills	line_name	VARCHAR 100	Line Item Description	FALSE	""
Bills	line_notes	VARCHAR 1000	Line Item Notes	TRUE	""
Bills	cost_amount	NUMERIC (10,2)	Amount attributed to Line	FALSE	0
Bills	allocation_methc	DECIMAL[]	Allocation Array, a Discrete Probability Density Function.	FALSE	[0.1,0.1,0.1,0.1,0.1,0.1,0.1,0.1,0.1,0.1]
Bills	timestamp	DATETIME	Timestamp for when this Line was posted.	FALSE	0
Bills	sent_to_ledger_f	BOOLEAN	Has this record been picked up by a batch process	FALSE	FALSE

and updated the General Ledger? Default: False

Models					
Table	**Column**	**DataType**	**Description**	**Nullable**	**Default**
Models	id	INTEGER	Unique ID	FALSE	0
Models	model_name	VARCHAR 250	Readable Model Name	FALSE	0
Models	allocation_array	DECIMAL[]	Allocation Array, a Discrete Probability Density Function.	FALSE	[0.1,0.1,0.1,0.1,0.1,0.1,0.1,0.1,0.1,0.1]
Models	timestamp	DATETIME	Timestamp for when this Model was posted.	FALSE	0

Best,
Harp

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