The Enron Power Grid:
Dynamic Queries of Campaign Contributions

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Introduction

The Enron scandal, beginning during the year 2001 and continuing to unfold at present, has focused attention on the relationship between powerful corporate interests and the politicians to whom they donate campaign contributions. Politicians are responsible for setting policy that directly affects the earning potential of these corporate interests, and in the case of such a scandal are also in charge of investigating alleged misdeeds. Yet in order to conduct a viable campaign for public office, vast campaign war chests must be acquired.

Laws are in place to regulate federal campaign contributions,[1] but the existing rules foster creative workarounds that continue to permit large funding amounts to be transferred from influence-seeking citizens and corporations, to politicians and their political parties. While various attempts to institute campaign finance reform to close these loopholes have been made in the last several years, none succeeded until March 2002, when, with the Enron scandal largely functioning as a catalyst, Senator John McCain's bill made it through the legislature and signed by President Bush. The law is currently in the courts, its opponents asserting that it violates First Amendment free speech protections.[2]

Motivation and related work

Numerous websites exist that are dedicated to information about and exploration of the scandal, sponsored by news organizations,[3] watchdog agencies,[4] and other groups.[5] Most contain articles, transcripts, document captures, and other textual information related to the investigation.[6] Some provide downloadable campaign finance data (for all donors and recipients, not just Enron-related).[7] Others contain graphical representations of certain aspects of the scandal.[8] But none provide a method for interactive exploration of the campaign contribution data in order to find trends and patterns.

This paper discusses the design, implementation and use of a dynamic querying tool that facilitates exploration of campaign contributions made by Enron to federal politicians.

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[1] The Federal Election Campaign Act (FECA), passed in 1971, amended in 1974 and 1979. See Figure 2.

[2] Epstein, Edward, "Foes of campaign finance overhaul waste no time in challenging law," *San Francisco Chronicle* (March 28, 2002).

[3] *Financial Times*, http://specials.ft.com/enron/FT3GIIYBNXC.html; HotTopicEnron, *HoustonChronicle.com*, http://www.chron.com/content/chronicle/special/01/enron/index.html

[4] Texans for Public Justice, "Bush, Lay Shielded Errant TX Businesses From Lawsuits," *Lobby Watch*, February 12, 2002, http://www.tpj.org/Lobby_Watch/enrontlr.html

[5] Enron Investigation, *C-SPAN.org*, http://www.c-span.org/enron/links.asp

[6] *The Virtual Acquisition Shelf & News Desk*, Thursday, January 31, 2002, http://resourceshelf.blogspot.com/?/2002_01_01_resourceshelf_archive.html

[7] Donor Lookup, *opensecrets.org*, http://www.opensecrets.org/indivs/

[8] "Understanding Enron," *The New York Times*, January 14, 2002, http://www.nytimes.com/2002/01/14/business/_ENRON-PRIMER.html

Data

The data available for exploration can be downloaded from the opensecrets.org website, and resides in a text file that is read in at runtime. The file contains campaign contributions donated by Enron employees (including employees of its subsidiaries[9]), Enron's PAC, and the Enron corporation and its subsidiaries (unregulated contributions, a.k.a. "soft money"), from the 2000 and 2002 campaign cycles (i.e. 1/1/1999 to the present[10]).

Determining the directions in which money flows from these entities to recipients took some untangling. Based on the database from which I downloaded it on the website, and taking into consideration the rules governing contributions, the money moves between entities as depicted in this table:

		To				
		Legislators	Party Committees	White House	Enron PAC	Other PACs
From	Enron Employees	✔	✔	✔	✔	✔
	Enron & Subsidiaries (soft $)	✔	✔	✔		✔
	Enron PAC	✔		✔		

Breaking these down into six entity types, we have Legislators (receive), Political Parties (receive), White House (receive), Employees (donate), Soft Money (donate), and PACs (receive and donate). Because PACs both give and receive, this created some challenges for the design of the tool, as it meant that entities could not be split up into donor types and recipient types. I wanted to ensure that the tool could explore money flowing in both directions from an entity in order to demonstrate how PACs fit in to the equation. I assumed (and this was later borne out, as discussed below) that the Enron PAC operated as something of a slush fund, into which employees donated, and from which the funds were passed on to the intended candidate.

Contributions from Enron employees were made *to* many PACs (and these have all been included in the data), but as for the contributions *from* PACs, the data include only those made by the Enron PAC. Non-Enron PACs received relatively small amounts from Enron employees, so including all contributions from those PACs would have introduced distortions.

Design

So that campaign contribution data could be browsed in an interactive manner, I designed a dynamic querying tool, the Enron Power Grid. The simple, aesthetically pleasing layout consists of a series of linked bar graphs, one for each entity type, laid out in a grid pattern. (See Figure 1.) Each graph is accompanied by a scrolling list containing the individual donors or recipients of that type, and a labeled box surrounds each pair of components. The recipient types (Legislators, Political party committees, and White House occupants) are in the top row. The donor types (Enron and subsidiary employees, Enron and subsidiary soft money) occupy the middle row. PACs, due to their ability to give and receive funds, are a special case requiring two graphs, and this entity type is positioned on the bottom row. A text field to the left of the PACs displays the current totals based on the current query.

The graphs map nominal data (entities) along the x-axis and interval data (contribution dollar amount) along the y-axis. The inner framework is gray, with horizontal lines facilitating dollar amount comparison

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[9] http://www.c-span.org/enron/links.asp#subsidiaries
[10] 2002 cycle is *Based on data released by the FEC on Monday, March 11, 2002, http://www.opensecrets.org/

within and between the graphs. Vertical bars make up the specifier, an appropriate choice for conveying the relative values within and between charts.[11]

Care was taken to ensure that each graph's y-axis has the same scale (and that each graph is rendered at the same size), in order to promote a clean comparison of results. Thus, the length of a bar in a given graph is directly comparable to the length of other bars within and among the graphs. While it would have been more dramatic to allow the default setting to fill each graph's inner framework with the bars of the specifier, this would have distorted the relative volume of contributions from/to certain donors/recipients.

Entity types are distinguished from each other by the use of color. A colored border around each graph denotes that entity's type. The appearance of this color in a different entity's graph (coloring the appropriate vertical specifier bar) indicates that contributions have been made to or received from this other entity. In every graph, the bars making up the specifier are painted in the same order. So, each entity's bar can always be found in the same relative location in each graph. A static graphic in the center of the display uses arrows (color-coded by entity) to reinforce the directions in which money flows to/from each entity type.

Within a given entity type, the list is in close proximity to its accompanying graph, and each type is clearly distinguishable from the other types on the display. Each list is tightly coupled with the graphs and the totals text field. To construct a dynamic query, the user selects one or more entity names from one or more lists. All the graphs and the totals field update upon each selection, indicating the amount of contributions made and received given the current selection. Each entity type (and its corresponding graph) has a relationship with each other entity type (and its corresponding graph). To remove a type from the query, the user sets its list to None.

Implementation
The application was implemented with the Java 2 Platform, Standard Edition, version 1.3.1, using Swing components to construct the GUI. The Chart2D open source graphing package was provided by Jason Simas.[12]

The graphing package provided a great deal of functionality, but also imposed some constraints. Multiple graphs can be displayed at once, they redraw relatively quickly, and the framework is fairly customizable. However, one of the axes can contain nominal data only. This made it difficult to show the relationship between time and amount of contributions, which had been one of the original design intentions. In addition, text clearly labeling each entity on the x-axis was not possible, due to the rather restrictive manner in which data must be structured. Thus, some design decisions were made in response to the functionality of the graph package.

Discoveries
Using the application to explore campaign contribution data, we can see that the amount of Enron's contributions highlights the limits set by existing campaign finance laws (see Figure 2), as well as loopholes circumventing those limits, and the app may have uncovered some improprieties. First, we examine the contributions flowing from individuals to candidates and national party committees by setting Employees, Legislators, Parties, and White House to All, and the others to None. We can see that Legislators and White House received about $162,000 and $127,000 respectively, while Parties received $575,000 over the four-year period for which data was collected. Because the limits for parties are so much higher than for candidates, this seems to make sense.

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[11] Kosslyn, Stephen M, Understanding Charts and Graphs, *Applied Cognitive Psychology* 3 (1989), 185-226.
[12] http://chart2d.sourceforge.net/License.htm

However, when we change the Employees list to "Lay, Kenneth L," former CEO of Enron, we see that nearly $300,000 of those contributions to political parties came from him alone. Further, nearly all of that went to a single national party committee, which can be observed by changing the Political Parties list to "RNC." (See Figure 3.) This appears to point to donations over the limit, as contributions from an individual to a single party are not to exceed $20,000 per year ($80,000 for the period under observation).

Another interesting discovery can be made by looking at the money flowing to and from PACs (entitled "Multicandidate committee" in the limits chart in Figure 2). By setting Legislators and PACs to All, and the other lists to None, we see that donations from PACs were approximately $350,000. Now by setting Legislators to None, and Employees to all, we observe that the donations from Employees to PACs were also about $350,000. This could indicate that a system is in place to funnel money from (more stringently limited) individuals to candidates via (less restricted) PACs.

Discussion

The application works quite well for exploring contributions between entity types, and is useful to some degree in examining contributions from/to specific entities. To fully implement interactive analysis of the data, the following issues must be considered.

The application properly incorporates direct manipulation fundamentals by allowing the user to select parameters by pointing with the mouse, and by presenting results visually and updating immediately upon selection. Also, query selections are reflected rapidly in the display, although they are not immediately reversible.[13]

To construct a query, the user sets the desired parameters, and the display continually updates upon each selection. This dynamic query filtering works solidly, but additional settings could reduce confusion and further facilitate exploration. While it is useful in some cases that all the graphs relate to each other, it can sometimes be disconcerting when attempting to view totals for a specific relationship, to find that relationships with other entities are included as well. During a demonstration of the system, repeatedly setting the various lists to None, All, or a set of specific entities, in order to pull them in and out of the query, was perceived as a cumbersome workflow. To address these issues, an additional, stricter query setting could be implemented, allowing the user to mark only those entity types whose selections are to be searched for. Those marked types would still relate to the selections in the other types (marked or unmarked), but the selections in the unmarked types would no longer relate to each other.

The difficulty of drilling down to a specific donor or contributor, and the inability to drill down to a specific contribution, are also factors preventing the application's full realization as an interactive data exploration tool. Currently the data is aggregated by entity, and then those entities are aggregated within the entity type. Due to the large number of entities, a visualization incorporating zoom and Focus+Context would be helpful here.

The graphs and totals text field update fairly quickly (approximately 500 ms) on the machine on which it was developed, a Dell Optiplex GX110, Pentium III, 933 MHz, 512 MB. Immediate feedback (~100 ms) is necessary to give the user the sense of "touching" the data, hence current performance is not quite sufficient to meet the standards for tight coupling between controls and display.[14]

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[13] Shneiderman, B, *Designing the User Interface: Strategies for Effective Human-Computer Interaction: Second Edition*, Addison-Wesley Publ. Co., Reading, MA (1992), 573 pages. As referenced in Shneiderman, Ben, *Dynamic Queries for Visual Information Seeking* (1994).
[14] Eick, Stephen G, *High Interaction Graphics* (August 17, 1994), 7; Ahlberg, Christopher and Shneiderman, Ben, *Visual Information Seeking: Tight Coupling of Dynamic Query Filters with Starfield Displays* (1994).

Future Work

In addition to the aspects mentioned just above, filtering features, the ability to compare contributions with other companies, and usability studies will improve the tool as well.

A timeline slider (accompanied by graphics providing information about key dates during the Enron scandal) would enable selection of a range of dates, filtering out all contributions outside of the range. More filtering capabilities, such as categories in the lists, like "All Democrats" in the Legislators list, will also improve the tool's efficacy for data exploration.

To provide perspective on how Enron's campaign contribution behavior compares with other companies within the industry, and perhaps how the oil and gas industry relates to others, additional data could be added for comparison. A line graph would show a comparison of the desired items.

The use of color to distinguish among the entity types should be subjected to user evaluation as to its efficacy. Are the colors distinct enough from one another to discern among the types? In addition, are the number of items in the display overwhelming? With seven perceptual groups (six entity clusters and the text totals field), this may be at the upper limit of perceptual processing abilities.[15] If so, ways to consolidate the items will be examined.

After adding the ability to drill down to individual data points, and more filtering functionality, a usability study should be employed to determine the application's facility at uncovering trends and answering questions about the Enron scandal, or campaign contributions in general.

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[15] Ericcson, Chase, and Faloon, 1980. As referenced in Kosslyn, Stephen M., Understanding Charts and Graphs, *Applied Cognitive Psychology* 3 (1989), 185-226.
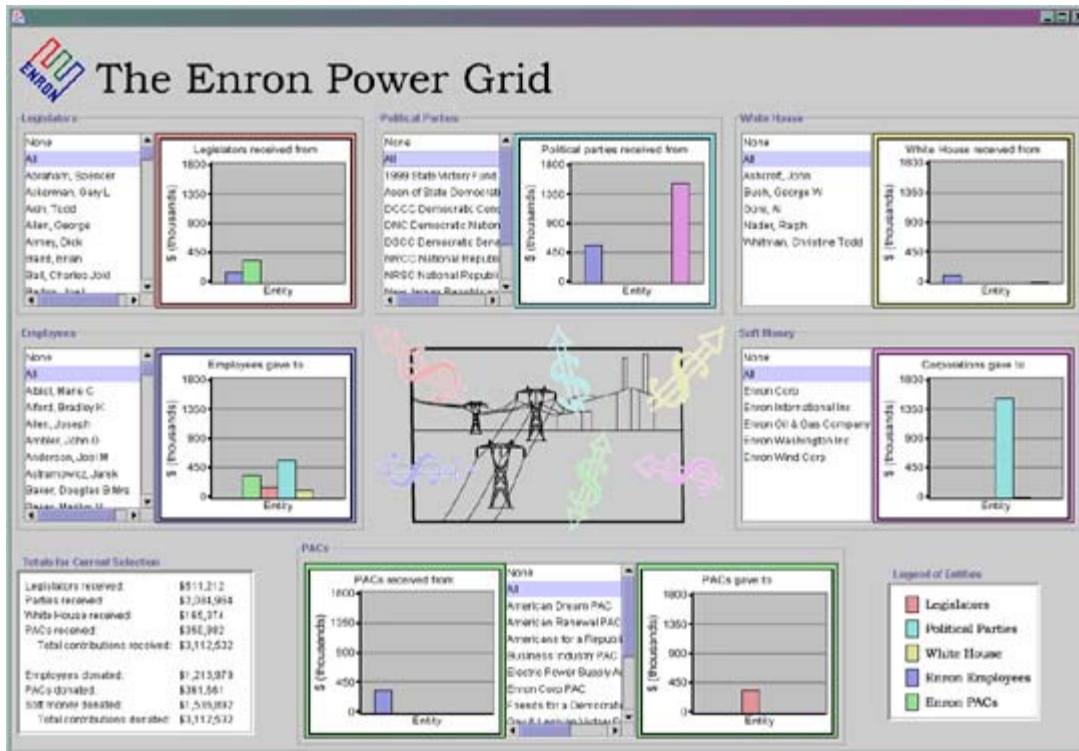
Figure 1. The Enron Power Grid Layout

Contribution Limits

	To a candidate or candidate committee per election	To a national party committee per calendar year	To any other political committee per calendar year*	Total per calendar year
Individual may give:	$1,000	$20,000	$5,000	$25,000
Multicandidate committee † may give:	$5,000	$15,000	$5,000	No limit
Other political committee may give:	$1,000	$20,000	$5,000	No limit

*Exception: If a contributor gives to a committee knowing that a substantial portion of the contribution will be used to support a particular candidate, then the contribution counts against the donor's limit for that candidate (first column on the chart).

†A multicandidate committee is a political committee with more than 50 contributors which has been registered for at least 6 months and, with the exception of state party committees, has made contributions to 5 or more candidates for federal office.

Figure 2. Contribution Limits[16]

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[16] http://www.opensecrets.org/basics/law/limits.asp

Legislators

None
All
Abraham, Spencer
Ackerman, Gary L
Akin, Todd
Allen, George
Armey, Dick
Baird, Brian
Ball, Charles Jokl
Barton, Joe L

Legislators received from
1800
1350
900
450
0
$ (thousands)
Entity

Political Parties

Assn of State Democrati
DCCC Democratic Cong
DNC Democratic Nation
DSCC Democratic Sena
NRCC National Republi
NRSC National Republi
New Jersey Republican
RNC Republican Nation
Republican Party of Ore
Texas Republican Cong

Political parties received from
1800
1350
900
450
0
$ (thousands)
Entity

Employees

Kohnstamm, Kevin R
Kopper, Michael J
Krause, Gregory D
Labanowski, Elizabeth
Landwehr, Susan M
Lassere, Donald
Lay, Elizabeth A
Lay, Kenneth L
Lay, Mark K
Lee, Amy H Mrs

Employees gave to
1800
1350
900
450
0
$ (thousands)
Entity

Totals for Current Selection

Legislators received:	$25,500
Parties received:	$282,910
White House received:	$28,000
PACs received:	$0
Total contributions received:	$336,410
Employees donated:	$336,410
PACs donated:	$0
Soft money donated:	$0
Total contributions donated:	$336,410

PACs

PACs received from
1800
1350
900
450
0
$ (thousands)
Entity

None
All
American Dream PAC
American Renewal PAC
Americans for a Republi
Business Industry PAC
Electric Power Supply A
Enron Corp PAC
Friends for a Democrati
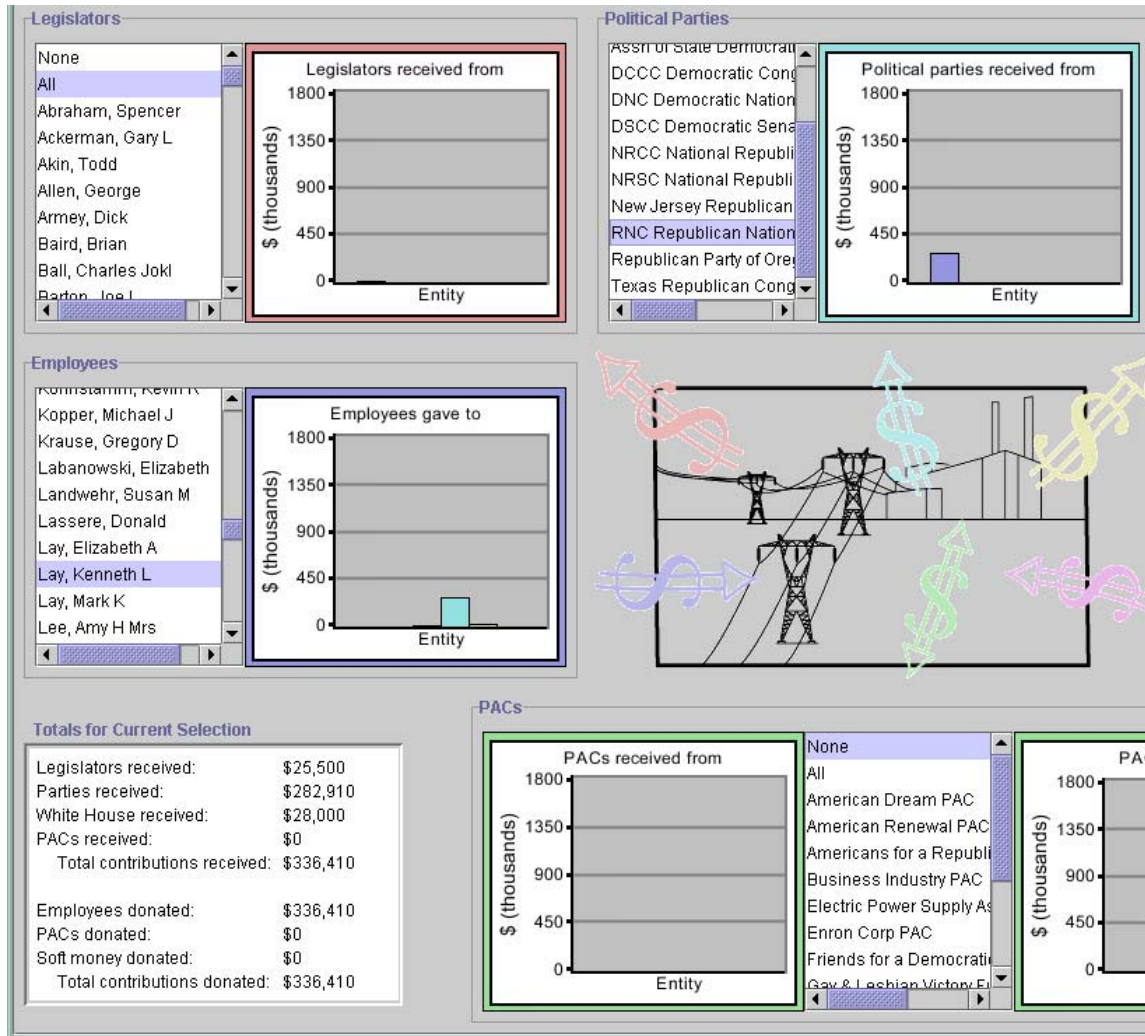Gay & Lesbian Victory F

PAC
1800
1350
900
450
0
$ (thousands)

Figure 3. Kenneth Lay Contributions to the RNC Appear to be Over the Limit