

The Cain Gang ISP Management System

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Chapter 1

ISP Management Systems

The title of this book is “The Cain Gang ISP Management System”, but this system is actually a conglomeration of several systems designed to work together. These systems manage the physical system accounts and files on the system, perform billing functions, and keep accounting records.

The Cain Gang ISP Management system is a robust and flexible system which can manage all facets of a UNIX based ISP. Most of the system’s interfaces are web browser based, and so can be accessed remotely from virtually any platform, and are encrypted through transport layer security (TLS/SSL).

Billing System

This system keeps track of subscriptions, discovers when it is time to bill each customer, calculates how much a customer is to be billed (for resources used, or for arbitrary services), and creates and sends invoices. It then makes billing information available to an accounts receivable system.

The billing system can also include various billing related subsystems, such as a live credit card transaction system, or an automated pre-authorized bank withdrawal system.

System Management

The system management system (if you’ll forgive the systemic over frequent use of the word system) examines the billing accounts, and creates the actual physical resources required by the clients. This would include, for example, creating web directories, maintaining passwords, making mailboxes and aliases, setting up DNS records, and more.

Much of the system management information is filled into account records by administrators, but there also provided is a web based client interface for setting some preferences, and activating certain features.

Accounting System

As mentioned previously, the billing system makes the information about who has been billed available to an accounts receivable system. The accounts receivable system summarises and keeps detailed accounting records which can be used for financial statements and making sure all accounts are balanced.

Work Order System

If your ISP handles installations or other external jobs, the Cain Gang ISP Management system can provide a work order scheduling system. Work orders can be generated at the time accounts are created, or manually via a calendar based interface. Work orders are provided to technicians, and track what has been done.

1.1 Requirements of the CGIMS

The Cain Gang ISP Management requires the following software:

UNIX We prefer to work on the NetBSD <http://www.netbsd.org> platform, however the billing system should work fine on any UNIX-based operating system which supports the software listed below.

Python 2 A high level interpreted programming language. Most of the system is put together with Python. Python is easy to understand and modify, making the system extremely flexible and easy to customise.

PostgreSQL 7 A professional Open Source relational database engine. PostgreSQL supports, for free, all of the required features of expensive commercial database systems, along with specialisation and extensions not found in other packages.

Apache 1.3 The Apache web server provides the platform for the web based interface.

PyGreSQL Provides the interface between python and the PostgreSQL database server.

Miscellaneous Other small common packages may provide additional services, such as the GD graphics package.

If there were interest in the billing/accounting parts of the system to be supported on the Microsoft Windows platform, a port to that system may be possible. The above software is available for other platforms, but the billing system has not been tested or specifically adapted to them.

Chapter 2

Client Accounts

2.1 Account Structure Overview

There are three main *levels* which may comprise an account. This three level system allows for an enhanced level of billing flexibility. It allows clients to be billed in several different ways for any number of resources.

2.1.1 Client Level: Personal Information

The client level includes the client's name and contact information. Other billing information such as credit card details are attached to this level. This level *can be thought of as representing a person or other entity*, and the various details relating to that person.

2.1.2 Billing Group Level: Account Type and Billing Dates

A billing group represents in the most general sense *what the client* (client level) *is being billed for*. The billing group specifies an "account type" within the system, and various details regarding the account such as the home directory where the accounts for this group are based. The billing group is also the level which keeps track of the billing period and term dates, so that the system knows when the client is to be billed. Clients can be disconnected at the billing level by marking them inactive, or setting a disconnect date, causing them not to be billed any longer.

~!q~A client may have multiple billing groups attached to them. A Billing Group may have many accounts attached to it. A billing group, however, may be attached to only one client (or else how would you know which one to bill?).

2.1.3 ~Account Level: System Resources

The account level *usually represents an actual system account*. This includes some sort of login ID and password, as well as an indication as to what services the account may have access to. An account level record may represent an individual web site, a mailbox, or specify whether a shell or dialup can be accessed. The account level

specifies several other parameters, some of which are accessible to the user via the client's web interface for customisation of things such as email forwarding, and shell program.

2.1.4 Recurring Billing Level: Anything Else?

Although the system is centered around the previously described three levels, there is another type of record which may be regarded as another level. A recurring billing record is similar to a billing group, except that it has no account type associated with it. In fact a recurring billing record has hardly any information associated with it beyond the basics of a name and a description, and how much and how often a certain client is going to be billed. Recurring billing can be attached to clients to bill them any amount for any arbitrary service on a regularly recurring basis.

2.2 Creating System Accounts

Accounts can be created by system administrators, or they can be created by users applying to the system. Accounts created by a system administrator. The latter group requires the activation by a system administrator before they become live.

2.2.1 Group Edit Privileges

In each billing group there is usually one special account to which a "group edit" flag is attached (sometimes referred to as a "Group Leader" account). This account is given some additional authority over the other accounts in its group. Any account with the "group edit" privilege flagged will be able to view the settings of the other accounts in the group (in the web-based user login area), as well as change most of them¹. A group leader account also has the potential to access functions such as viewing the billing history for the group, adding mailboxes, changing credit card information, and so on. Non-group leader accounts in the billing group will not see or have access to these functions.

It has been said that there is usually only one group leader account in a billing group: this is because the first system account created in a billing group is given this "group edit" flag by default, while subsequent accounts that may be added are not given it by default. The flag can be toggled manually by an administrator on the system account page. There can potentially be more than one group leader account in a billing group, or even no accounts in a billing group with this privilege.

2.3 Terminating System Accounts

Accounts can be terminated or suspended on any of the *levels* of the system. Deactivating a client will cause all billing groups beneath that client to cease being billed. Deactivating a billing group will cause the client (who may remain active) to stop being

¹To change the password requires knowing the current password, however.

billed for any accounts or services beneath that billing group. Individual accounts may also be deactivated, and then will not be included in the tallying of resources being used by the billing group they are attached to (and the client will of course no longer be able to use that account as long as it remains deactivated).

“When clients want their account terminated, deactivation of billing groups can also be scheduled by filling in a deactivation date in the billing group record. Effective immediately, as soon as a deactivation date is filled in, the client attached will no longer be billed for that billing group; however, the billing group will remain active until the deactivation date is reached. With these behaviors in mind, one should not fill in the deactivation date on a billing record until the billing group is within its last period of service.

2.4 Account Types and Attributes

The term “account” is at risk of vagueness. Sometimes when the term is used it may refer to accounting-related accounts, or in an abstract sense it may refer to a client. The more specific term “system account” may refer to a specific service (such as a login shell, or a web site).

When an “account type” is referred to in relationship to the billing system, however, it usually represents a service (or group of services) which the ISP offers to a client, and which is specified in the client’s “billing group” record.

The reader should be aware that the term “account” may be used in any of the above senses, and the meaning only indicated by the context. Be careful.

2.4.1 Defining/Creating New System Account Types

An “account type” to the billing system is a template which names and defines how much a service, or group of services, will cost the client, and how often they will be billed. Account types store basic information such as which G/L accounts will be applied, whether “system accounts” created under a billing group of the given account type will be allowed a web directory, a static IP address, or a virtual domain assigned, etc. Along with these basic properties, account types will list a number of “attributes” attached, and give the details of how the resources represented by each attribute is to be billed for, and how much will be charged if extra resources of the given type of attribute are exceeded in a billing period or term; and finally, how the attribute will be treated on an invoice.

2.4.2 Account Attributes

Account attributes control the quantity of a given resource which is included in a account type, as well as the rate at which extra charges will be applied. For example, an account attribute for web traffic might specify that a certain account type allow one gigabyte of traffic per period, and that extra megabytes beyond that limit within the period be billed at 5 cents each. Account attributes can also specify special billing modes, or turn off billing for certain attributes entirely.

2.5 Relevant Billing Dates

In addition to recording the exact creation moment at all levels of a client's account, the billing system tracks various dates for billing purposes. These significant dates can be found in the client's billing group record.

2.5.1 Start Date

The Start Date is the date upon which a billing group was started to be billed. This may be different from the creation time of the account. On systems using work orders for installations, this date will be the date the installation was scheduled for.

2.5.2 Due Date

The Due Date is the date on which the billing group's current "term" ends. This date is broken down into three parts. The month and the year are obvious in meaning, and what is termed the "anniversary" is the day of the month. This "anniversary" day of the month is used for calculations regarding the billing group's "period". At the end of a billing group's term, the client is charged the subscription fee for the next term, along with any extra services which are billed on a term basis.

2.5.3 Period Date

The Period Date is the date on which the billing group's current period started. This date consists of a year and a month. The exact day of the month is controlled by the "anniversary" part of the billing group's "term" due date. This allows for billing groups whose billing begins on the 31st of a month (or the 28th of February on a leap year) to be handled correctly during shorter months.

The period start date indicates the next earliest date on which the client will be invoiced; this will occur exactly one month (assuming the account's period is set for one month) after the current period's start date. At the end of a period, extra charges for most service overages are calculated and billed for. Other charges (account transactions) that may have accumulated will be billed at this time also.

(Note: certain account transactions may be invoiced on the next billing day, bypassing the period date calculations).

Chapter 3

Billing: Following the Money

3.1 Keeping Track of Amounts Owed

3.1.1 Account Transactions: Finding Out What Is Owed

The billing process runs automatically every day. It searches for clients' billing groups for whom it is time to bill. This means it searches for clients for whom the current date is on or beyond the client's billing record's "Period End" or "Due Date"¹.

For each *active* billing group identified as being eligible for billing, all relevant resources used by that client are examined. If the resources used are found to exceed the amount of resources included in the billing group's account type, then the customer is charged the extra fees set for that resource type in that account type. Some extra fees apply only at the end of the "term" (for example, extra mailboxes) to be billed when the client pays their usual account fees; certain other fees (for example, charges for extra web site traffic) are applied every billing "period" whether the client's term is yearly, monthly, or some other timespan.

Additionally, the billing process searches for billing groups which have had their "disconnect date" set, and the current date is now beyond the "disconnect date". Billing groups matching this criteria are marked inactive, and no further billing is done for inactive billing groups. It is important to note that no billing is ever done for any billing group which has a disconnect date specified; so one should never set a disconnect date on a billing group except within the last "period" before the billing group is to be deactivated.

For each item found where the customer owes money on (whether it be their end-of-term re-subscription fees, or extra charges at the end of a period), an itemised "account transaction" is created in the database, otherwise known as a "line item". These line items are used to then create invoices.

¹A "period" is usually one month, while a "term" is usually 12 months or 1 month, depending on whether the customer has a yearly or monthly billing contract.

3.1.2 Recurring Billing: Special Cases

Recurring billing records are handled separately from the regular billing process. The reason for this is that recurring billing items are not defined as a part of any particular account type, but represent any arbitrary service for which you want to bill a client periodically.

3.1.3 Invoicing: Letting the Customer Know They Owe

The process of creating invoices is very simple. It is a manual process, but consists merely of clicking the confirmation button on the “Make Invoices” page.

Invoices are created by examining all of the “account transaction” records created by the automated daily billing process. All of the account transactions for each customer are grouped together, summed up, and converted into an “invoice record”. The invoice record is then sent to an invoice printing process and the invoice is formatted and sent to the customer.

There are several ways that the customer may receive an invoice, which may be specified in the client’s account record. The most common is simply via email. Some clients, however, prefer to have their invoices printed and mailed to them. The invoice printing process examines the client’s account preference, and sends out emails to those who prefer email, and sends the invoice to the printer (ready to be mailed) for those who prefer a hard copy.

3.1.4 Posting Invoices: Letting Accounts Receivable Know They Are Owed

After the invoices have been created for the customer, the accounting system still needs proper records to keep track of what is owed to the company. This process is called “posting the invoices”, and is as simple as the invoice creation: one merely requests the invoices to be posted with a single click on a web page.

The postings do not *immediately* appear in the A/R system, but are actually posted to a special holding area. Another process is then required to pick up the newly posted accounts receivable records and put them in the A/R system. These processes are separated so that if an external A/R system is used, external processes can be created to import the A/R records from the holding area into the foreign system. For companies that use the A/R system built into the billing system, a process runs periodically (every 15 minutes by default) which then imports the A/R records into the final A/R database.

3.2 Receiving Payments

There are various methods by which clients may render payment.

3.2.1 Processing Cash and Cheques

3.2.2 Processing Preauthorised Credit cards

3.2.3 Automated Credit Card Billing

3.2.4 Manual Credit Card billing

3.2.5 Processing Preauthorised Bank Withdrawals

3.3 Other Billing and Accounting Activities

3.3.1 Journaling

It is normal practice to “journal” general ledger accounts periodically: usually at the end/close of every month to finalize all the accounting for that period. Once G/L transactions have been posted to G/L they are never allowed to be changed in the database. If there are errors in posted records (over payments, forgotten data, etc), adjustments must be made to the general ledger in following periods.

Journaling the accounts receivable transactions is as simple as accessing the A/R journal web page, and selecting the “journalise” function. The administrator will then be asked what the last date to include in the journal will be (usually the last date of the previous month), and all A/R transactions up to that date which have not previously been journaled will be processed into the next journal.

Closed journals include some simple sums and counts to verify that the journaled transactions have not been tampered with, should they ever come into question.

Journals may be reviewed at any time, of course. In this same area a list of journals can be displayed, and any journal accessed. Each journal is summarised in two ways when displayed:

Transaction Type Summary A list summing the total monetary amount of transactions in each A/R category. The categories currently include: Adjustment Transactions, Credit Card Transactions, Notes (Credit/Debit), Pre-Authorised Withdrawals, Receipt Transactions, and Invoices.

G/L Summary A list of all G/L account numbers and the monetary sum of transactions for each. The sums are divided into credit and debit columns, and the sums of each column, which should always balance out equally, are printed at the bottom.

Detailed listings of the A/R transactions for each G/L account in the journal, or of a specific transaction type, can be printed by simply by clicking on the G/L account number or the transaction type label. (Note that these detailed listings are rendered somewhat crudely as plain text due to many web browsers having difficulty rendering very large tables.)

3.3.2 Credit and Debit Notes

3.3.3 Reversing Payments (NSF)

Unfortunately there are times where a payment has been recorded in the billing system, but the money never materialises and so the payment needs to be reversed. This may happen due to a client's cheque bouncing (for reasons of non-sufficient funds in the account), a pre-authorised withdrawal being rejected, or a credit card charge being reversed. There may also be other special circumstances where a payment needs reversing.

The Cain Gang ISP Management system provides the ability to reverse the payment on any invoice. This interface is usually accessed from the client's record: a link appears near the top which accesses the "Reverse Payment (NSF)" function. When this link is followed a list will be shown of all the payments on invoices in the client's billing history. When the invoice payment to be reversed is located and selected, an input appears allowing the administrator to write a note giving the reason the payment is being reversed.

Many companies want to charge clients a "processing" fee for NSF/reversed payments. Depending on the system configuration, there will appear a checkbox that may be selected which will charge the client such a fee, when the payment reversal is confirmed (ie. the final submission button pressed). This fee (set in the system configuration) will be added as a line item in the client's account transactions, and the client will be invoiced for the fee at the soonest opportunity.

3.3.4 Reports and Details

3.4 Collections

When a customer owes a significant amount of money for a long period of time, some special action may need to be taken. The billing system refers to this action as putting someone into "collections": that is, the "collections" flag is set on the client's record.

3.4.1 Collections Modes

A process runs nightly and examines all of the clients to see who needs to be put into collections. There are two modes that this process may run in: "manual" and "auto". What mode the billing system is in is controlled by the "Collections" setting on the system information page (sysinfo).

Manual The collections flag on a qualifying client's records is not set. An email report for each client in this category is generated to the address specified in the system information as "collect_email" (with the reply-to set to the system information "billing_email" setting). Note that unless action is taken (ie. the customer's balance reduced, or the customer's record "collections" flag checked) this report will be generated again every time the collections process runs.

Auto The collections flag on the qualifying client's record is set immediately, as well as the report as described in the "manual" mode is generated.

3.4.2 Qualifying for Collections

A client is considered to qualify to be given collections status if they owe more than a specified amount for 90 days or more. The minimum amount the client must owe in order to qualify is set as "COLLECTIONS MIN" in the system information.

3.5 General Ledger Accounts

For accounting purposes, all transactions will end up in the company's general ledger. For systems using The Cain Gang ISP Management System's A/R system, all billing transactions will be imported into specified general ledger accounts.

The default general ledger account, if none other is assigned to a transaction is the account known as "*misc sales*", which can be defined in the system settings.

All G/L accounts can be defined in the "Chart of Accounts" area. This area will list all G/L accounts defined on the system, allow them to be edited, and new ones added.

Chapter 4

Procedures

4.1 Customising the System

4.1.1 Look and Feel

The system's overall appearance can be altered globally. The entire top and bottom portions of the pages displayed may be designed in any way desired; this includes colours, fonts, and menus. The contents of each page is then simply inserted in the "middle".

The method of defining the surrounding "look and feel" of the system is achieved by inserting the relevant HTML code into a special file. These customisations will likely be done when the billing system is installed, but can be altered at any time.

Since the interface is all web based, all of the menus can be completely customised. One is free to organise links and function into sub-menus or present them on a single page as desired, whichever is most effective for your organisation's needs.

4.1.2 sysinfo: Configuration and Settings

The central place for setting and modifying the configuration of the system is the "sysinfo" (System Information) page. This page lists all of the parameters and settings in the system. This page is divided into a few sections, as follows:

Client	All information regarding the system's company, including the billing address, client identification code, and contact information.
System	Settings related to the physical system, including network settings, paths to files, and so on.
G/L	The definition of all of the system general ledger account numbers. This controls how the billing and accounting systems categorise transactions.
General	All the other settings for the system, such as report email addresses, limits and defaults for various functions of the system.

The SYSINFO entries, one per row, list the entry label (or code), a brief description of the entry, the entry *data type*, and finally the actual value. In order to edit a value the label must be selected, which will send the browser to an edit page. There are a few sysinfo entries which may not be edited, these will not provide a link via their label to the edit page.

The *data types* are mostly straight forward, but some are specialised. They are as follows:

- String Any words, or text; this is the most basic data type
- Integer Any numbers (decimals will usually be chopped off)
- Float Numbers with decimal points
- G/L Account A general ledger account number; the format for this is two groups of numbers (a major and a minor) separated by a dash. Eg: 51001-1006.
- Text Text is treated the same as a string, however a multi-line input box is provided for editing/inputting this item.
- Colon List Several strings separated by a colon(s); where these appear there will be special instructions given in the description or help text when you edit the item, describing the format required.
- Comma List Several string separated by commas; this is the same as the colon list, except it uses commas instead of colons.

Chapter 5

Security Interface

5.1 Administrative Access Controls

5.1.1 The Admin Flag

There are several methods of restricting access to parts of the Cain Gang ISP Management System interface. The most basic is the 'admin' flag. Anyone who does not have an admin flag is completely locked out of the system administration interface.

The admin flag is found in a person's account record.

At the time of writing this, there is no web based interface to the admin flag. You must have your database administrator grant the admin flag to desired accounts.

5.1.2 Group Permissions: Finer Access Controls

All accounts which have the admin flag set have the possibility of accessing the web based administration interface, but the admin flag alone does not necessarily grant access. There is a secondary security system which can grant access to certain pages to defined groups of administrators, either with full access, or restricted to read-only access.

To define which admins have permission for what pages Access Groups must be created. The access group interface allows the creation and editing of access groups. When an access group has been created, the group members may be modified.

A list of all accounts with the admin flag is listed when an access group is looked at. Beside each name are two checkboxes. One checkbox indicates that the accompanying admin is a member of the current access group, and the second checkbox must be checked if the admin is to have 'update privileges' in this access group. Update privileges allow pages which are assigned to a given access group to be modified, and new records created. If the admin does not have the update privilege flag, they will not be able to make any changes to pages in the particular access group. An admin must have both the "member" and "update" checkboxes checked to have full access to pages under a given access group.

The way pages are assigned to access groups is on a 'script-by-script' basis. The web browser calls certain files/programs to perform certain functions. Each of these programs presents the interface for certain functions; each program can be assigned to an access group.

An administrator with access to these access permission pages must be careful not to remove their own access from them, or they themselves will be locked out.

Since each program can only belong to one access group, access groups may need to be organised with some thought to yield the desired security results.

5.2 Client Interface Access

Clients can access their own password protected user page. However the first system account created under each billing group has a special "group edit" flag. This flag can be toggled, or given to other accounts in the billing group, but by default only the first account has it. This flag allows that account to also access and change settings for all other accounts beneath the same billing group.

Accounts with the "group edit" flag also are potentially given other options that accounts without the gedit flag will never see. These accounts are allowed to see a list of all the accounts within the billing group, to change the credit card information for the group, and also add resources to the billing group (such as extra email boxes).

5.3 A Note About Passwords

Passwords are stored in an encrypted state within the database, and (without resorting to cracking methods) the unencrypted password is not available to anyone after it is set. This means that if a client loses or forgets their password the only remedy is to set a new password for them; it is effectively impossible to retrieve the passwords in the database in a usable form.

Since the client interface requires users to know their old password in order change it to a new one, if a client has lost their password, they will have no recourse except to contact the ISP and have an administrator reset their password to a new one.