Making Supplier Payments in the Direct Broadcast Satellite (DBS) Industry

May 24, 1995

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Abstract

Contracts negotiated with program providers (i.e., suppliers) authorize the broadcasting of programs for a license fee. Some of these contracts can specify complex payment terms and conditions based on transactional and statistical information acquired from distributing the programming to consumers. Gensym's G2 has been integrated with existing business systems to create a Finance application called the Supplier Management System (SMS). This system allows end-users to diagram the payment logic of a contract so that payments can be calculated automatically. At the end of every accounting period, SMS retrieves the necessary data for each contract, flows this data through the payment logic diagrams, and arrives at a lump sum payment due to each supplier. Furthermore, SMS proportionately allocates this payment to all programming offers to generate marketing statistics and determine the equitable payment share of distribution partners. As the direct broadcast satellite market expands, G2 will continue to be a vital component in meeting the challenges presented by the growth and fluctuation of business needs in the supplier payment arena.

Overview of DIRECTV®

DIRECTV, Inc. ("DIRECTV"), a unit of Hughes Electronics Corporation, provides a direct broadcast satellite (DBS) service to homes and businesses throughout the continental United States. DIRECTV beams up to 150 channels of entertainment and informational programming directly to television sets equipped with a DSS®; a satellite receiving system consisting of an 18-inch dish, an addressable receiver/decoder, and a remote control unit. Programming is transmitted through several 120-watt Ku-band transponders aboard high-powered HS 601 satellites built by Hughes. The transmission system, which employs the MPEG-2 standard for digital compression, delivers digital quality audio and video. DIRECTV began service in select areas of the United States in June of 1994.

The programming available to consumers consists of feature films, sports, special events, subscription services, and special interest services. Feature films include Hollywood's top pay-per-view releases and classic movies, foreign films, children's programming, action/adventure films, and comedies. Sports programming includes almost all televised sports including basketball and football at both the professional and collegiate levels.

Special events include promotionally ticketed occasions such as boxing matches and concerts. Subscription services include basic cable programming, as well as several premium movie and entertainment channels. Special interest services consist of channels for the educational, vocational, cultural, scientific, international, and foreign language niche markets. Additional programming, such as data services and interactive services, will become available as those markets develop.

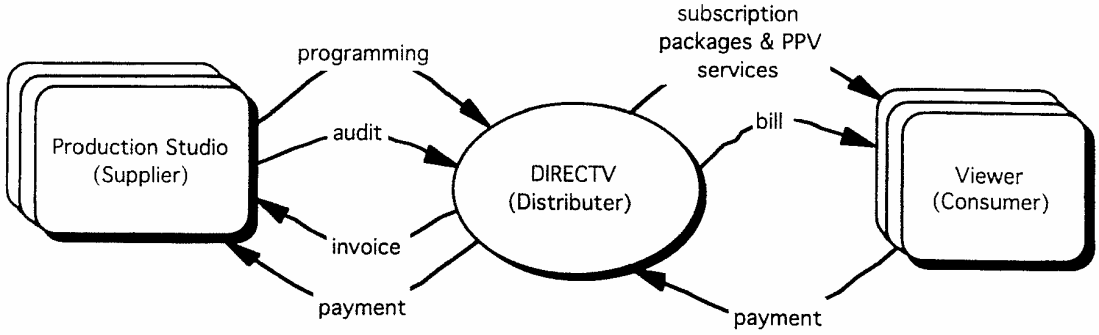


Figure 1: Overview of DIRECTV

In order to present a wide variety of programming to the consumer, DIRECTV negotiates with numerous suppliers for the rights to broadcast their programs. These negotiations can result in a contract authorizing the distribution of the supplier's services for a license fee (i.e., supplier payment.) DIRECTV then distributes the programming to the consumer in the form of subscription packages and pay-per-view (PPV) services. Revenue is subsequently collected by billing consumers on a monthly basis for the services they receive. At the end of every accounting period, DIRECTV calculates the payment for each contract and sends an invoice along with the payment to the respective suppliers. Figure 1 illustrates DIRECTV's role in providing the variety of programming to the consumer.

Supplier Payments and Statistics Department

The Supplier Payments and Statistics (SP&S) Department of DIRECTV Finance is responsible for the accurate determination of payments due to the supplier and the final posting of service statistics. In order to carry out this task, the SP&S Department must be notified of any new contract developments via a contract term sheet from DIRECTV Business Affairs or via a deal memo from DIRECTV Program Acquisitions. At the end of every accounting period the SP&S Department retrieves programming distribution information from DIRECTV Billing.

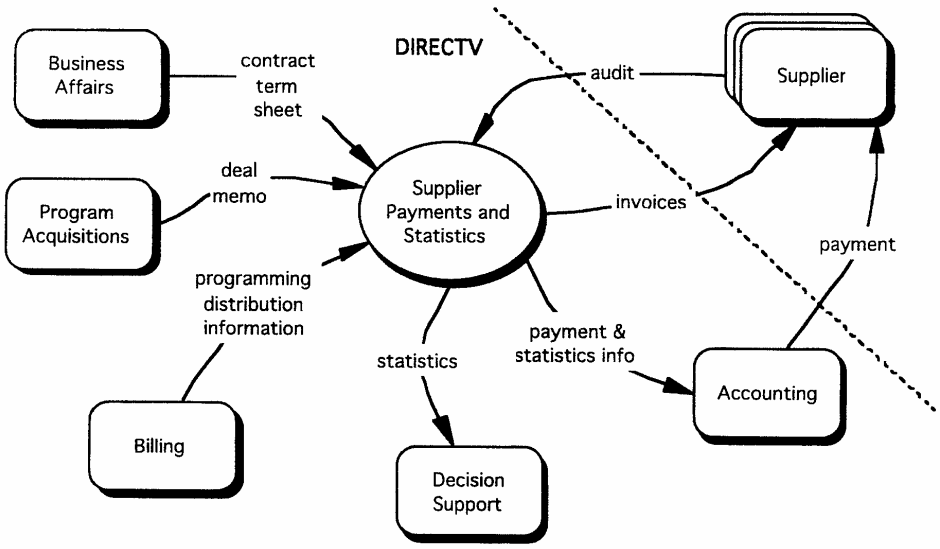


Figure 2: Overview of the SP&S Department

The integrity of this information must be verified extensively by the SP&S Department in order to determine the correct payments due to the suppliers. The SP&S Department then generates supplier invoices detailing the subscriber statistics and amounts payable for each service. Since DIRECTV creates invoices, suppliers retain the right to audit them; therefore, the information on the invoice must be incontrovertible. Additionally, the SP&S Department allocates the supplier payment to all programming offers to determine the relative contribution of the offer to the final amount. This allows DIRECTV to gauge the success of marketing efforts with respect to the expense of each programming offer. Moreover, since the National Rural Telecommunications Cooperative (NRTC) is responsible for distributing the programming in rural areas, this allocation determines the NRTC payment share due to DIRECTV.

Supplier Management System

The Supplier Management System (SMS) is the primary Finance application used by the SP&S Department to load and verify billing data, calculate payments, and generate reports and invoices. The SMS architecture consists of three meta-applications running on a DEC platform: Sapiens' Ideo is used for building screens, managing data, and generating reports; Gensym's G2 is used for modeling contract payment logic and calculating payments; and Oracle's Rdb is used for storing and accessing the data. Additionally, SMS employs a number of third-generation language codes (e.g., COBOL) for processes and interfaces that require maximum efficiency.

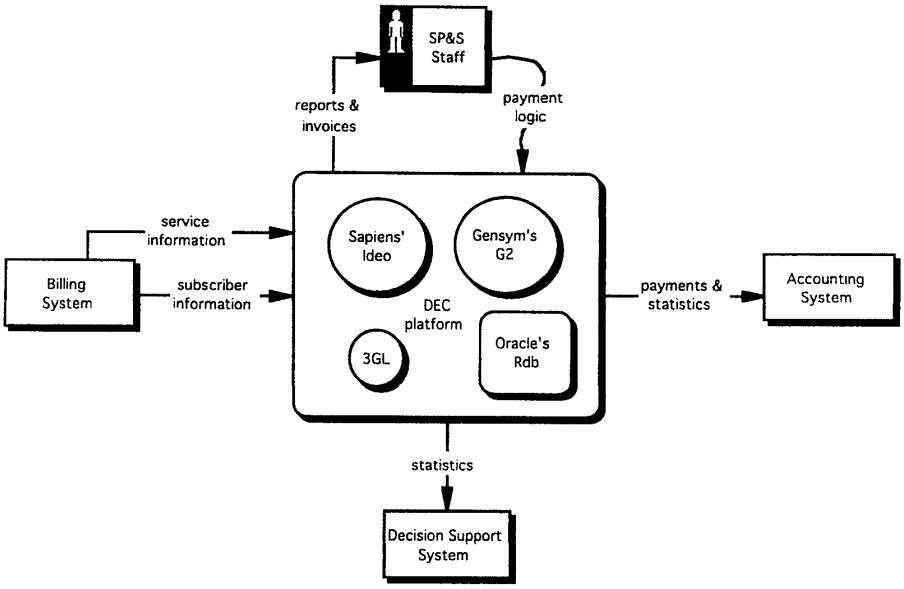


Figure 3: Overview of SMS

The SP&S Department is responsible translating contract payment terms into payment logic that SMS can interpret. The SMS receives interface files from the DIRECTV Billing System containing service and subscriber information. After processing the data, the SMS generates a payment file and a statistics file for the DIRECTV Accounting System as well as a statistics file for the DIRECTV Decision Information System. Furthermore, the SMS maintains its integrity by keeping audit trails on all incoming data and by cross checking multiple data sources.

The Complexity of Calculating Payments

On the surface, calculating a payment appears simple: multiply a rate by the number of subscribers that purchase the service. In reality, calculating a payment can be complex along several dimensions. First, there is the complexity of the contract payment terms. Since DIRECTV is a relatively new broadcast medium, a contract with a supplier is likely to contain one or more conditional payment terms, based on DIRECTV's performance in selling a supplier's service(s). The measurement of this performance can vary across contracts; for instance, to determine how well a service has penetrated the DIRECTV market, the number of subscribers receiving the service is divided by the available subscribers. Unfortunately, there are several definitions of available subscribers. Thus, the determination of the available subscribers for a particular contract requires the accumulation of subscriber-specific data.

A second aspect of complexity results from the packaging of subscription services. A package is a set of services sold as a unit and an "a la carte" service is a package of one service. DIRECTV Marketing creates packages, subject to both contractual and technical constraints, to accommodate the sale of services as well as to facilitate the marketing effort required to sell services.

Consequently, when a contract specifies varying payment rates for different packaging scenarios, each package containing the service must be analyzed to determine the applicable rate.

A third aspect of complexity arises when a contract specifies a payment rate that depends on the number of subscribers receiving a specified set of services. Since a subscriber may receive some services "a la carte" and other services as a package, the applicable rate can be determined only by accumulating the service profile of each subscriber.

Modeling and Executing Payment Calculation

In order to tame the complexity of determining payments, the SP&S department staff encodes the logic of a contract's payment terms using G2. Collectively, the set of payment logic elements can be viewed as a library of payment "building blocks." Thus, when the payment terms of a new contract are similar to previously encoded contract terms, the new contract can be modeled from objects in the library. When a new contract introduces a payment term that does not correspond to an object in the library, the payment term is implemented as a payment logic element and added to the library. When the payment logic elements are connected on a G2 workspace, the result is a payment logic (PL) diagram. This diagram identifies what to pay, when to pay, and how to pay for a service provided by a supplier.

To calculate the payment due to a supplier, the associated PL diagram is "executed." Execution is the process of carrying out the logic specified by a PL diagram given the information associated with the distribution of a supplier's programming. When G2 accumulates this information from records in Rdb, the resulting objects are known as service usages (SUs), which contain either the subscriber count for a subscription service, or the number of buys for a pay-per-view service. A PL diagram flows SUs through the logic path(s) and returns a lump sum payment for each SU. The lump sum payments, known as service payments (SPs), are then proportionately allocated to the associated service usage records in Rdb.

In summary, the three phases of calculating payments are:

- modeling the contract's payment logic as a PL diagram
- retrieving programming distribution information, and
- executing the PL diagram given the programming distribution information.

Modeling Contract Payment Logic

Payment logic elements, which represent contract payment terms, can be classified as conditional, operational, or administrative. Conditional elements, depicted by circular icons, determine which payment logic elements are applicable; operational elements, depicted by borderless icons, represent functions to perform; and administrative elements, depicted by rectangular icons, control the behavior of groups of payment logic elements. Figure 4 shows the object hierarchy of the Payment Logic Element.

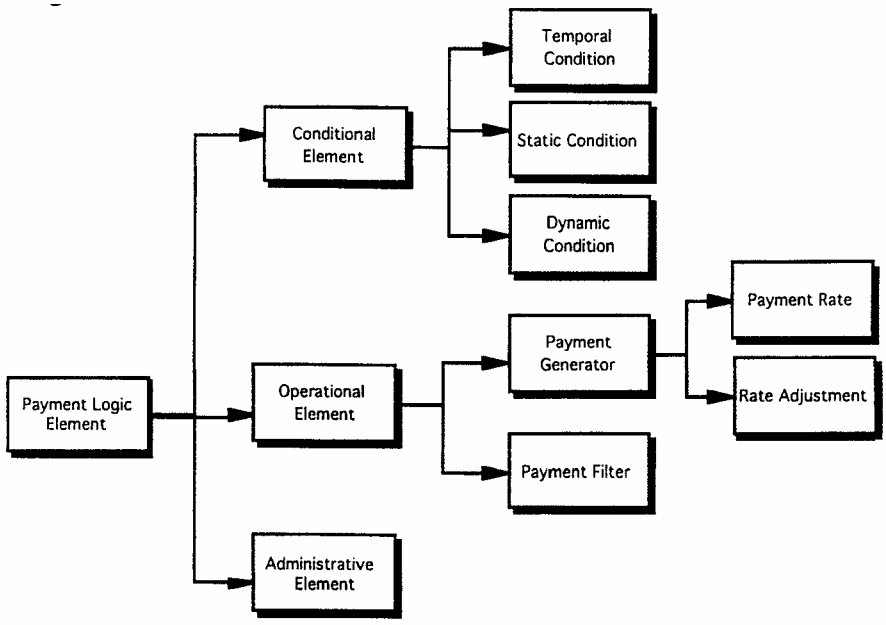


Figure 4: Object Hierarchy of Payment Logic Element

The translation of a contract's payment terms into a PL diagram is a process of iterative analysis and verification since some contract terms and conditions may be ambiguous. A PL diagram is a directed graph of payment logic elements arranged from left to right. For example, Figure 5 shows the PL diagram of a contract identified as C3. This contract specifies that the number of subscribers to be used in the payment calculation is a monthly average and that, in 1995, the payment shall be 20 cents per subscriber whose account type is REG and 10 cents per subscriber whose account type is VIP.

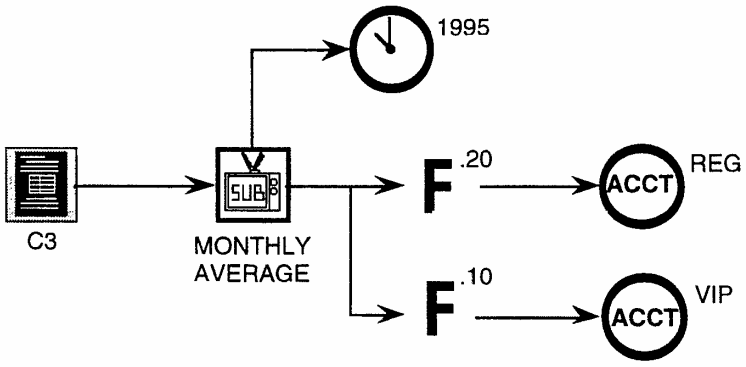


Figure 5: Example of PL Diagram

Conditional Elements

A contract can specify a variety of conditions that influence the payment for a service. These conditions can be classified as temporal, static, or dynamic. A condition whose truth-value depends on time is a temporal condition. A condition that specifies a criterion to be used in the accumulation of service usage records is a static condition. For example, a contract can specify that subscribers with a particular account type are exempt from any payment calculation. Conversely, dynamic conditions are conditions that can be determined only after the accumulation of service usage records. An example of a dynamic condition is when the number of subscribers to a service determines the applicable payment rate for that service.

A temporal condition is attached to a payment logic element to indicate that the element is applicable only when the time is within the specified upper and lower bounds. A periodic condition sets its truth-value depending on the user-specified accounting period. For instance, the period condition in Figure 5 effectively blocks the calculation of payments when the user-specified year is not 1995.

A set of static conditions is used to generate the conditional clause of a database query. A static condition acts like a sieve by filtering out those service usage records that do not meet the specified criterion. The records that are accumulated will meet the criteria established by a set of static conditions. The following is a list of static conditions and their associated record retrieval criteria:

Accumulated service usage records will include:

- A La Carte Package Condition — services that are sold "a la carte." (i.e. not packaged with another service and sold as a unit.)
- Account Type Condition — subscribers that have the specified account type(s)
- Packaged With Condition — service(s) that are packaged with the specified criteria
- Primary Owner — subscribers in an area served by the specified distributor (either DIRECTV and/or NRTC)
- Retail Rate — services that are sold at a price between the specified upper and lower bounds
- Services Allowed Conditions — service(s) that match the specified service code(s)

A dynamic condition is evaluated by accumulating service usage records and determining if the cumulative count falls between the specified upper and lower bounds. Dynamic conditions that are arranged in a tier can be used to select the applicable rate(s) from a tier of rates. For example, a contract may specify a rate of 70 cents per subscriber when the subscriber count is less than or equal to 100,000 and a rate of 40 cents per subscriber when the subscriber count exceeds 100,000.

In this example, the tier is said to apply discretely, since a single rate will *apply to all subscribers*. If, however, the contract specifies that the rate is 40 cents per subscriber *over* 100,000, then the tier is said to apply consecutively. In this case, if the subscriber count is 150,000, then 100,000 will be multiplied by the first rate and 50,000 will be multiplied by the second rate.

The following is a list of dynamic conditions along with their descriptions:

- Per Capita Retail Rate — The revenue generated by a service, divided by the available subscribers
- Subscriber Penetration — The number of subscribers receiving the service(s) divided by the available subscribers
- Subscriber Volume — The number of subscribers receiving the service(s)

Operational Elements

Operational elements represent functions to perform as specified by the PL diagram. These functions include creating, modifying, collecting or deleting service payments. Payment rate objects create service payments; rate adjustment objects modify service payments; and payment filter objects either collect or delete payments.

A payment rate object generates a service payment by performing an operation on a service usage.

Some of the more common payment rates, together with a description, are listed below:

- Compared Percent — Chooses between a deemed rate and a percentage of the retail rate and multiplies the chosen rate by the usage
- Flat Amount — Uses the specified amount and ignores the usage
- Flat Rate — Multiplies the specified rate by the usage
- Revenue Share — Takes a percentage of the revenue generated by the sale of the service (Note: revenue is the retail rate multiplied by the usage)

A rate adjustment object must be associated with at least one payment rate object. A rate adjustment object connected to an administrative element indicates that the adjustment applies to each payment rate connected to the same administrative element.
If a rate adjustment object is applicable, it generates a service payment that supersedes the service payment of the associated payment rate object.

The following is a list of common rate adjustments and their descriptions:

- Adjustment Amount — Adds the specified amount to the payment rate and multiplies the result by the usage
- Adjustment Factor — Multiplies the payment rate by the specified factor and then multiplies the result by the usage
- Adjustment Percent — Takes a percentage of the payment rate and multiplies the resulting rate by the usage

A payment filter accepts sets of payments from multiple payment paths, performs an operation over the sets, and propagates a resulting set of payments.

The following is a list of common payment filters and their descriptions:

- Max Payment — Compares sets of payments and propagates the set with the greatest payment total
- Min Payment — Compares sets of payments and propagates the set with the least payment total
- Sum Payment — Collects payments from all paths and propagates them as a set

Administrative Elements

An administrative element manages a set of payment logic elements as a group and controls the behavior of the group by propagating data specified by the contract or by the user.

- Contract — Associates a set of payment logic elements to an actual contract
- Payment Method — Analyzes its set of payment logic elements, accumulates the relevant service information from the database, and propagates the cumulative result to all connected operational elements.
- Subscription Payment Method — Accumulates subscriber counts from the payable subscription records
- PPV Payment Method — Accumulates number of buys from the payable pay-per-view records
- Tier Group — Retrieves a service usage statistic for a tier of dynamic conditions and also indicates if the tier applies discretely or consecutively (See Conditional Elements)

• Per Capita Retail Rate Tier Group	Retrieves the per capita retail rate by dividing the revenue by the available subscribers.
• Penetration Tier Group	Retrieves the subscriber penetration by dividing the number of subscribers to the service(s) by the available subscribers
• Volume Tier Group	Retrieves the number of subscribers to the service(s)

Retrieving Programming Distribution Information

The records for storing information associated with the distribution of programming are contract, service, component, package and subscriber. A contract record stores information relevant to a supplier. A service record identifies a service and is associated with a contract record. A component record links a service record to a package record and contains the service's allocated price within the package. A package record contains subscriber counts as well as subscriber-specific information such as an account type and whether the subscriber is in an NRTC area. A subscriber record contains the package profile of a consumer.

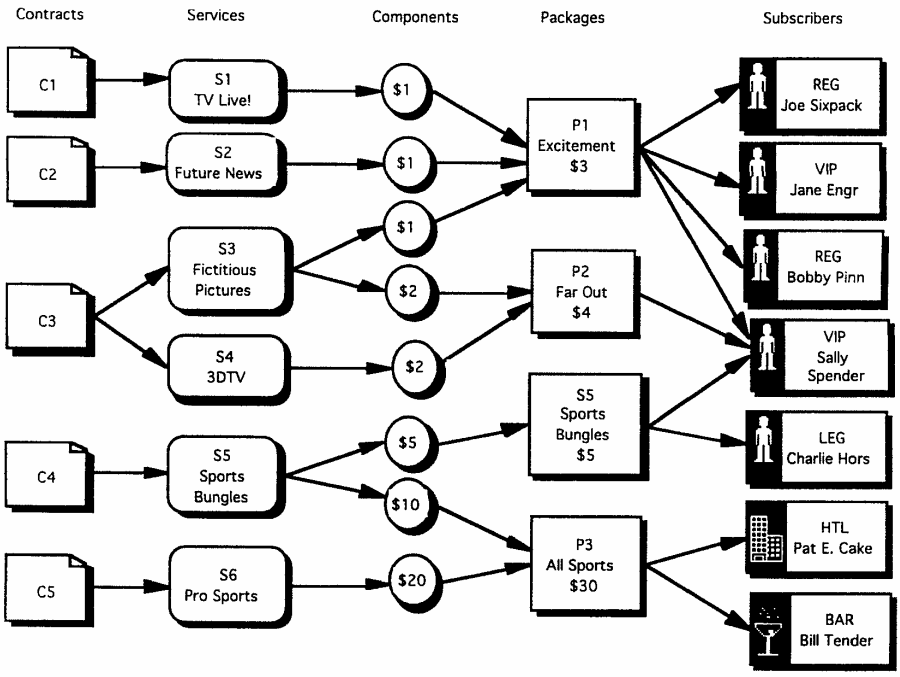


Figure 6: Example of Programming Distribution

Figure 6 is a fictitious example of a programming distribution scenario. Even with relatively few contracts providing a total of six services to seven consumers, the interrelations are complex. The services are sold in four packages containing a total of eight components; each component specifies its contribution to the package price. For instance, Sports Bungles is being priced at $5.00 as an "a la carte" package while being priced at $10.00 in the All Sports commercial package. In this case, contract C4 may require different payment rates for each offer based on the price. Furthermore, Sally Spender is receiving Fictitious Pictures (S3) from both the Excitement package as well as the Far Out package. Presumably, Sally has purchased the Far Out package just to receive 3DTV. In a case like this, contract C3 may specify that Sally really counts as two subscribers with respect to service S3 since it is being paid for twice.

At the end of each accounting period, programming distribution information is loaded into the SMS database from billing system interface files. After the information has been certified, the information is read into G2 as service usages

Executing Payment Logic Diagrams

The goal of executing a PL diagram is to determine how much money to pay a supplier. As mentioned before, a PL diagram is a directed graph of payment logic elements arranged from left to right. The initial starting point of a graph is a contract object that associates the rest of the payment logic elements to an actual contract. From a contract object originates directed connections to other objects that, in turn, originate directed connections to other objects, and so on. Since each path of payment logic elements has the potential of yielding payments, it is up to the conditional elements to determine the applicable payment processing path(s).

The five main phases that occur in the payment calculation process are.

- calling the "calculate-payment" method of each object (repeatedly);
- generating service usages (i.e., SUs);
- generating service payments (i.e, SPs);
- returning service payments; and
- allocating service payments.

The SPs that are eventually returned to the contract object are written to the database as payment records. These records are subsequently compiled into payments and statistics files for other systems.

To illustrate the payment calculation process, the following paragraphs will refer to a sample contract with a supplier named Fictitious Productions Inc. (FPI). For the purpose of demonstrating the algorithm, assume that the average number of Fictitious programming subscribers for the month is 1.5 million. Furthermore, assume that the number of available subscribers for the same month is 3 million.*

**The sample FPI contract and its corresponding PL diagram are attached at the end of this paper.*

Calling Calculate-Payment Method

The user must first initiate the payment calculation process via a G2 user interface screen. If the user specifies 'C3' as the contract number, the calculate-payment method of the contract object corresponding to FPI is called. This method calls the calculate-payment method of all directly connected (i.e., downstream) objects and expects to receive a set of SPs in return.

Since the only object connected from contract C3 is a max payment filter, the filter's calculate-payment method is called. The filter calls the calculate-payment method of the two downstream payment method objects (denoted by the TV-like icons.) Besides continuing the iterative calling strategy, the payment method objects also carry out the crucial step of generating SUs.

Generating Service Usages

The calculate-payment method of a payment method object must first determine its applicability to the payment process by checking that all downstream conditional elements are satisfied. If any condition is not satisfied, the recursive call is terminated and a NULL service payment is returned. For example, the period condition object (depicted by the clock-like icon) indicates that the payment method is only valid between the specified beginning and ending dates. If the current accounting period does not fall within the specified temporal boundaries, then that payment path does not apply.

Assuming the period condition object is satisfied, the calculate-payment method traverses each path of payment logic elements and tracks the set of static conditions in each path. The static conditions are used to build a database query that accumulates the service usage records relevant to the particular payment path. Since there is a single static condition directly connected from each payment method object in the PL diagram, each payment method object generates one database query. Each query only accumulates those programming distribution records associated with subscribers that have the 'REQ' or 'VIP', account types. Furthermore, the usage of the resulting SU is calculated by averaging the beginning and ending subscriber count for the month. The next step of the calculate-payment method is to propagate the SU to each downstream payment rate object.

Generating Service Payments

Looking at the uppermost payment method object, the flat rate objects are in a tier of volume conditions. Since the tier applies consecutively (note the *apply to all subs* attribute of the volume tier group object is set to 'false',) each flat rate object will generate an SP for a portion of the 1.5 million subscribers. The first flat rate object generates an SP whose value is $200,000. This value is calculated by taking 1 million and multiplying it by 20 cents. The second flat rate object generates an SP whose value is $40,000. This value is calculated by taking 0.5 million and multiplying it by 8 cents.

According to the PL diagram, the second flat rate is subject to a rate adjustment schedule that depends on a tier of penetration conditions. Since the tier applies discretely (note the *apply to all subs* of the penetration tier group is set to 'true',) only one rate adjustment will be valid. The first rate adjustment is an adjustment factor object. This object's condition is not satisfied since the ratio of 1.5 million to 3.0 million is over 40%. The second rate adjustment is an adjustment amount of 1 cent. This object's condition is satisfied since the ratio is between 40% and 70%; thus, the second SP (the one valued at $40,000) is superseded by a new SP whose value is $45,000. This value is calculated by adding 1 cent to the original flat rate of 8 cents and multiplying the result by 0.5 million. Since the schedule of rate adjustments applies discretely, the third rate adjustment does not apply to the payment process.

Since there are no other operational elements downstream from the uppermost payment method object, the two resulting SPs are valued at $200,000 and $45,000.

Looking at the lowermost payment method object, the flat amount object generates an SP whose value is $50,000. This value is calculated by using the payment amount specified by the flat amount object. Note, the resulting SP has an *effective* payment rate of three and a third (3 1/3) cents, which is calculated by taking $50,000 and dividing it by the usage of 1.5 million.

Returning Service Payments

Service payments are returned as a result of calling the calculate-payment method of each payment logic element iteratively. In most cases the SPs received from downstream payment logic elements will be returned to upstream payment logic elements. However, not all SPs survive the journey upstream since a payment filter object deletes SPs. In the PL diagram for FPI, there is a max payment filter that intercepts each set of SPs; one set is from the uppermost payment method object, the other is from the lowermost payment method object. The payment values of each set are tallied and compared. Since the max payment filter object chooses the set with the maximum value, the set valued at $245,000 is propagated to the contract object, while the set valued at $50,000 is deleted. Thus, the amount of money due to Fictitious Productions, Inc. is $245,000.

Allocation of Service Payments

Although the supplier payment is known to be $245,000, there is still one more phase to complete; the set of SPs must be written back to the database. Every service usage record that was accumulated via the database query will correspond to two payment records; one record at the 20 cent rate, and the other record at the 9 cent rate. The reason for two payment records is to insure that there is an equitable allocation of the supplier payments to all distribution partners. The payment allocation is weighted according to the distribution partners' contribution to the subscriber count. For instance, if a distribution partner's service usage records total 1500 FPI subscribers, the partner's resulting payment share is $245. This value is calculated by taking the sum of 1000 multiplied by 20 cents and 500 multiplied by 9 cents. This insures that a distribution partner has an equal share in the favorable rate for collectively participating in the effort to raise the number of subscribers.

Finally, note that a lump sum payment can be allocated to the granularity of the marketing campaign(s) whose subscribers contributed to that payment. A benefit of distributing the payment down to this level is the ability to calculate the net revenue of each contributing campaign. This figure can then be used to determine the return on investment of the campaign.

Summary

One can encode the sometimes-ambiguous language of a contract's payment terms into a precise language for calculating supplier payments. The exercise of translating a contract's terminology into executable (by a computer) payment logic helps clarify the contract and facilitates understanding of a contract's payment terminology.

The constructs of the resulting language are implemented as a library of payment logic "building blocks" (objects). For a given contract, the appropriate objects are connected in a directed graph, and methods of these objects are invoked to calculate the payment due a supplier based on the contract's payment terms. The payment is then distributed equitably amongst all program service distributors and the marketing campaigns used by these distributors.

The automation of payment calculation eliminates errors caused by the complexity of the data needed to calculate payments. The SMS, in particular the payment calculation component implemented in G2, enables the SP&S Department to make an accurate, timely payment based on a contract signed with a program service supplier.

Accurate and timely payments, along with the information needed to verify these payments, are of paramount importance to DIRECTV's maintaining its relationship with its suppliers. This in turn results in DIRECTV being able to provide the widest range of programming choices to its customers.

THE FOLLOWING SAMPLE CONTRACT CONTAINS FICTITIOUS DATA.

Supplier: Fictitious Productions, Inc.
Contract Number: C3
This contract is effective from May 24,1995 to May 26, 1995.

Section 3 - Payment Terms:
Payments shall be made at the end of each accounting month.

The payment shall be calculated as the sum of the payments in Sections 3.1 and 3.2 below:

Section 3.1-
For the first 1 million subscribers, the payment shall be $0.20 per subscriber.

Section 3.2:
When the subscriber count surpasses 1 million, the Base Rate for these subscribers (not including those counted in Section 3.1) shall be $0.08 subject to the schedule of adjustments in Appendix B. To get the payment, the adjusted Base Rate (also known as the Effective Rate), is multiplied by the number of subscribers over 1 million.

In any event, the total payment due Fictitious Productions, Inc. shall not be less than fifty thousand dollars ($50,000) for each accounting month.

Appendix A:
The subscriber count is the average number of subscribers for the accounting month. The average is calculated by adding the subscriber count at the beginning of the month to the subscriber count at the end of the month and dividing this sum by 2. Only those subscribers whose account types are REG or VIP are to be counted.

Appendix B:

If the Market Penetration (defined in Appendix C) is less than 40%, the Effective Rate is calculated by multiplying the Base Rate by a factor of 1.5

If the Market Penetration is at least 40% but less than 70%, the Effective Rate is calculated by adding $0.01 to the Base Pate.

If the Market Penetration is at least 70%, the Effective Rate is calculated by deducting $0.01from the Base Rate.

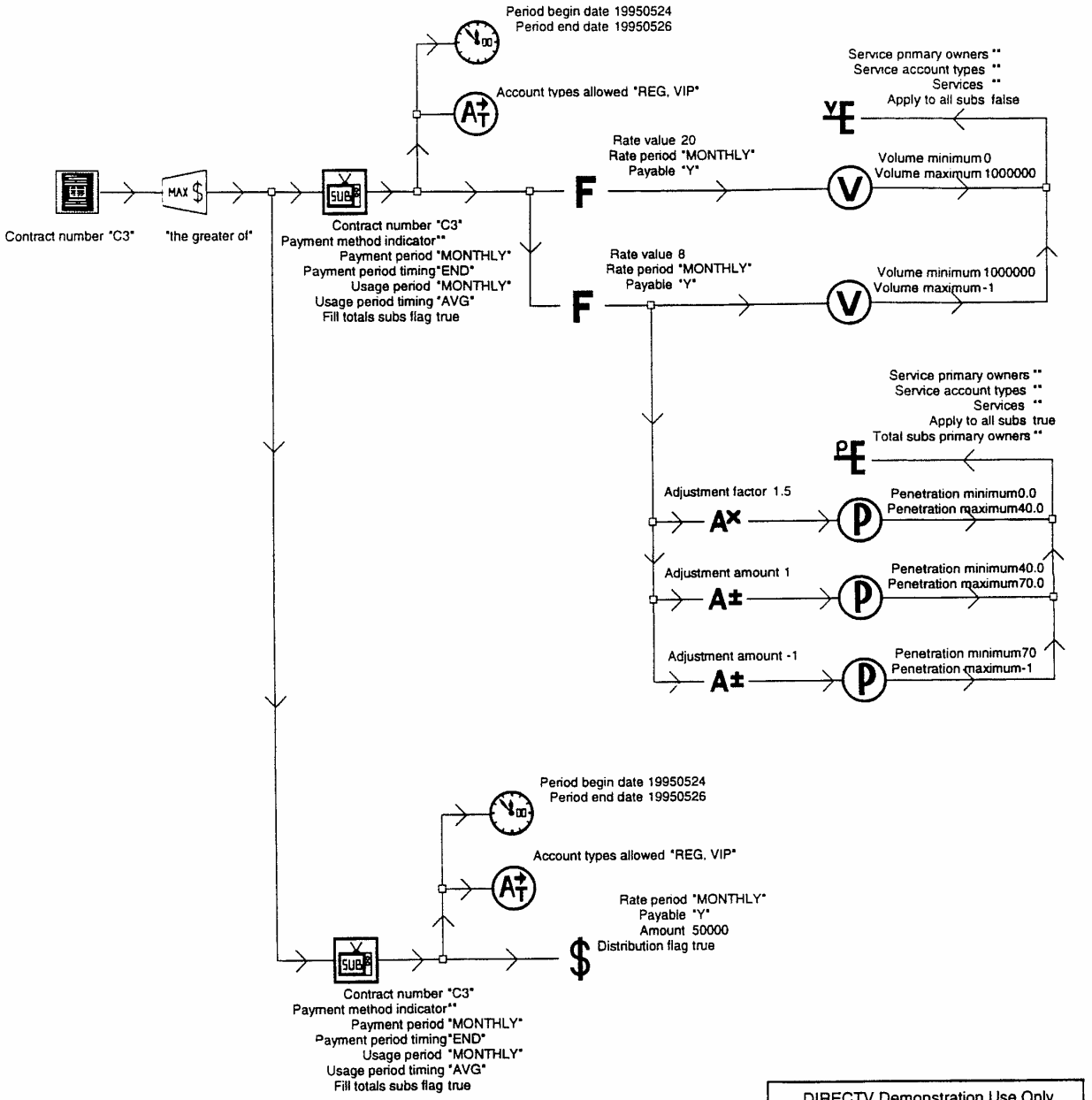
Appendix C:
The Market Penetration is calculated by dividing the subscriber count by the available subscribers whose account types are RES or VIP.

FICTITIOUS PRODUCTIONS, INC.: Date

PAYMENT-METHOD-FICT

FICTITIOUS PRODUCTIONS, INC.

Note: This Payment Method Diagram is for illustrative purposes only. Any resemblance to actual contracts, signed or unsigned, is purely coincidental.



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