The following white paper examines the implementation of operational support system (OSS) workflow within a communications service provider environment, including extension of the workflow to trading partners and incumbent local exchange carriers (ILEC) through gateways, at one end, and to customer self-serve, at the other end. The paper also focuses on using OSS to provision a digital subscriber line (DSL) service as one detailed example of an automated workflow.

We would be pleased to receive any feedback about this paper. Please send your comments or questions to info@eftia.com.

Implementing OSS Workflow: End to End to End

Implementing any large front- or back-office system can be a formidable challenge, but selecting and implementing an OSS platform is a daunting task even for IT-savvy telcos. The first step is to identify business processes used to support end-to-end workflows. This requires the involvement of numerous groups and key stakeholders within a telco, going through many hours of painstaking detailed work to document manual and partially automated processes currently used within the business. The next step is matching those requirements with an OSS that will meet both current and future business needs—through configurable parameters that can be modified for each service provider.

The use of configurable business processes within an OSS enables service providers to set up the applications to accommodate their specific way of conducting business. Configuration of the business processes and parameters typically relates to modification of the workflow process, but can extend to adding new functionality based on existing entries in the underlying data model of the application. New functionalities can also be added by extending the database model to existing forms.

An OSS application interacts with external systems in order to conduct many of the essential business functions required to complete a service order. This can include, the creation and delivery of service request information from a service provider to an incumbent local exchange carrier (ILEC) for local access, for example. An application can also integrate with billing systems for delivery of subscriber and order information, as well as with advanced workforce administration systems used to assign, schedule, track and report on the activities of both inside and outside field technicians. Finally, an application can integrate with network activation and management systems for both the provisioning and monitoring of network elements.

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Provisioning DSL Service: An Example

To illustrate the major steps in the order fulfillment process for a data provider delivering DSL, let' s first take a look at a basic workflow scenario. (Different flavors of DSL—ADSL, HDSL, SDSL—would have similar order fulfillment processes, although slightly different activities would be spawned.)

A business customer places an order for a DSL line. Connection for a DSL link is made directly from the communications service provider's network (a-end) to the subscriber' s location (z-end), bypassing the public switched network. Several possible connection setups are used depending on whether voice and data traffic is to be supported across the same twisted pair.

Details of the customer's request are captured in an order management OSS, including the selected feature set (data/voice/voice and data), requested activation date, address, contact and billing information. Once the order is validated and submitted, a series of activities can be spawned automatically. Several provisioning groups might be notified to configure the switch and perform the required wiring. The groups can include field technicians, switch and other equipment programmers, and central office technicians. The field technicians receive advance warning of the new installation, its requirements and schedule, which is kept in a pending state until the internal assignments are completed.

As the internal provisioning group completes its activities, the inventory can be updated automatically, and other dependent activities can be initiated. These activities are entirely data driven and can be added to, modified or deleted at any time by the system administrator, a key feature in the context of workflow flexibility. Each activity follows its own workflow and once all activities are complete, the overall service order automatically goes to a completed state and billing actions are triggered, once again, automatically.

Using OSS to Provision DSL: Details

Let's take a more detailed look at the OSS provisioning process for a DSL service order as a means of exploring what is involved in implementing workflow. The workflow process within an OSS application for DSL includes a number of elements: central office rollouts, rollout of nodes and customer loop qualifications, including truck rolls. Sub-workflows could include equipment requisition, installation and activation. Workflows and the application process rely on the functional underpinning of the OSS, including its centralized data storage.

As a first step, the competitive local exchange carrier (CLEC) would have to ensure that loop specifications meet the requirements of DSL technology. As part of a presales or provisioning process, the CLEC would need to ask the ILEC to ensure that interconnections are workable. If the loop length or connecting equipment cannot support the DSL technology, then the service cannot be delivered and the customer must be notified as soon as possible. These requests would become tasks of the service provisioning process provided by the OSS and spawned automatically by the original order. The task, in this case a local service request (LSR), can be electronically transmitted to an ILEC through an interconnection gateway. This reduces or even eliminates labor intensive steps in the

overall provisioning process. The overall time needed to complete an order is reduced because electronic requests are handled faster at both ends than manual requests (paper forms, faxes, phone calls, etc).

Central Office Rollout

The central office rollout actioned by an OSS application is comprised of 10 basic steps to ready a central office for DSL. (see figure 1)

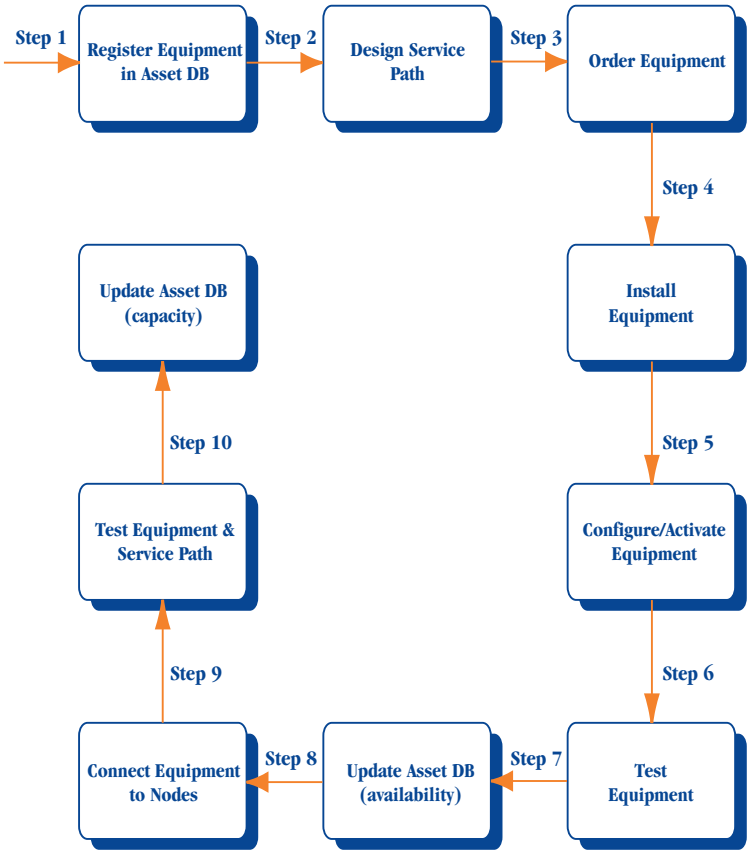

Figure 1: OSS workflow for provisioning DSL-CO rollout sequence

Customer Rollout

The next major step in the sequence is the customer rollout. The workflow process to validate outside plant and other transmission circuits along with the delivery and turn-up of DSL service to a subscriber includes the following steps (see figure 2):

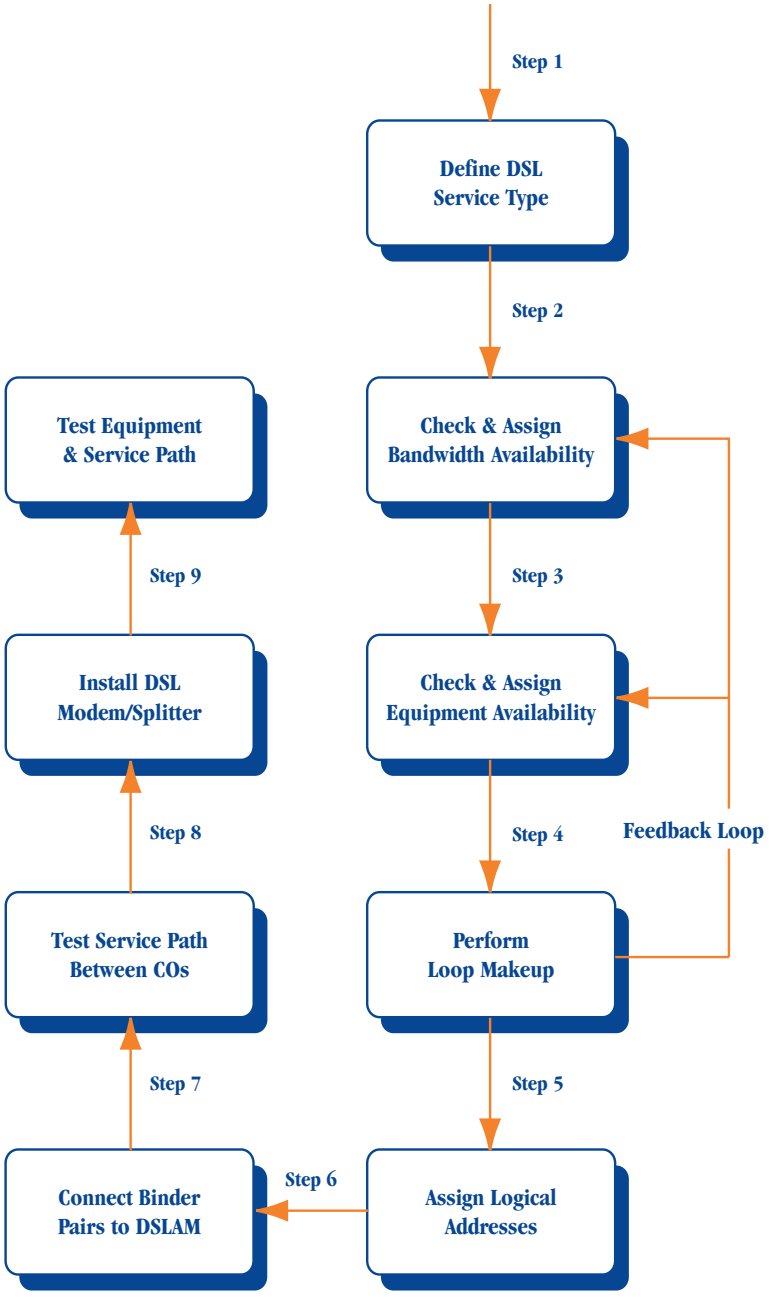

Figure 2: Customer rollout workflow

A number of other events are also triggered, or keyed, by the workflow engine. It might send requests through a service activation system to configure a switch or other equipment in the CO, such as digital subscriber line access multiplexer (DSLAM) or line cards. It might trigger requests to a billing system to create a new subscriber record, or to add new services to a subscriber profile.

In a typical order process flow, the OSS system provides the ability to take an order and action all the different activities required to complete that order—LSRs, circuit design requests, facility requests to other carriers, internal work orders, and access service requests (ASR), if necessary.

Validation rules ensure the accuracy of order entry and play an important role in the initial order management process. Some of the validation rules are built on the client side and some on the server side. One can define fields as mandatory, and if data for the fields is not complete, the system will return a message asking the user to enter the information needed to submit the order to the system.

For transmission of information to external OSS or trading partners, an OSS gateway can be used. It must be designed to communicate ASR, LSR, primary interexchange carrier/customer account record exchange (PIC/CARE), local number portability (LNP) and other transactions. The ability to automate these transmissions can lead to significant savings in time and money for telecom service providers and give them a real edge over the competition.

The automation of the interconnection tasks shortens the overall time to complete an order through the pre-population of order information, which is then automatically transmitted using multiple forms of electronic distribution, such as faxing and EDI formats. Automation of this process also brings a formality and a definable process associated with external carriers and trading partners. This is critical to offering guaranteed levels of service.

Benefits of Flow-Through

The benefits of flow-through replicate the benefits of automation: the service provider can avoid errors due to manual input, with concomitant economies in staffing and time; automated reconciliation of network inventory is provided; and order entry can be done by less knowledgeable staff.

On the billing side, more accurate and more timely billing information can be delivered through automation. Often, billing entries are made days, weeks, and even a month after service turn-up. The ability to begin billing in a more expeditious time frame enables service providers to recognize revenues sooner, while also allowing them to better manage cash flow.

On the maintenance side, the service provider can be proactive in spotting and correcting network and system errors, thus limiting downtime. This is a key consideration when service providers are faced with potential penalties (customer rebates) or lost revenue associated with service level agreements (SLA) that are bundled with a service offering.

When you consider the sheer number of manual tasks required to provision services, the benefits of automation are all too apparent. It can take a telecommunications service provider 25 to 40 separate tasks to provision a simple phone line. More complex services, like DSL or data connection, can involve more than 100 tasks. (Technology Research Institute 1999) Moreover, each task takes time. Consider these figures: "Lucent Technologies reports that at one large carrier, the 60-day interval required to provision a data circuit represented only 12 hours of actual work. It took all of the remaining 59 days to hand off information from department to department and system to system." (Technology Research Institute 1999)

Choosing OSS for Workflow Automation

When choosing to implement an OSS, a service provider should consider a number of factors:

- Does the OSS provide complete end-to-end flow-through provisioning?
- Does the OSS provider have the telecom expertise needed to bring added-value to the implementation of the product?
- Is the OSS product adaptable, scalable and easily integrated? Can the OSS adapt to the rapid addition of new services by a telecom service provider, as well as scale readily to replicate the inevitable growth of the provider?
- Does the product rest on a foundation of centralized integrated data stores, cross-linked and accessible from all modules of the application?
- Does the OSS adapt readily to unbundled systems? Can the OSS combine aspects of different services into a customer-defined bundle. For example, can you place an order for selected portions of a unified messaging plan, plus a videoconferencing service? Can the OSS do this on a pay-for-use basis?
- Does the OSS allow multiple carrier access?
- Does it use open and standard application program interfaces (API)? Does the OSS gateway application support interface protocols, such as file transfer, structured query language (SQL), electronic data interchange (EDI), peer-to-peer, and customized API? Does it provide near real-time one-way or two-way forms of communication?
- Does it offer quick service deployment, in order to limit customer churn and ensure customer retention for the telecom service provider?
- Do the OSS product solutions help eliminate operational entanglement and "spaghetti" architecture?

Building an end-to-end OSS solution is a complex process. It involves numerous systems and tools and takes time to implement. Consider an OSS that offers an "out-of-the-box" solution for as many parts of your OSS needs as possible. Consider also one that can add new services in hours or even minutes, as opposed to weeks or days.

The OSS selection process is critical. You need to select an integrated OSS or one that can rapidly integrate within any CLEC's architecture. Implementing an OSS involves making pragmatic business decisions that will give you the best bang for your buck.

Implementing Flow-through

For those service providers with a customer or order-fulfillment focus, the foundation of OSS for internal systems is order management in the service management layer. Order management coordinates the actions of all the other systems by establishing the workflow to track work, manage service levels, track jeopardies, handle errors and other activities.

The order management system touches on everything a provisioning process needs to do, whether for a DSL rollout or provisioning of any other service. It provides the structure and configuration for the entire OSS environment, including data capture, inventory, service activation systems, billing systems, OSS gateways to hand off requests, and the workflow engine to activate and direct the flow of information and processes. All this can be automated eventually, but a realistic approach means some manual steps will likely still be necessary along the way.

Generally speaking, it is advisable to first put the data in order. Centralized data stores are a key element in achieving integration of all applications. When selecting an OSS, ensure that it offers a data stores system wherein all services are "inherited" from data views of the underlying technology (DSL, ATM, etc). This means that the technology required to provide a service doesn't change but the packaging of service offerings can be changed through renaming or bundling of services supported by the data (engineering view). This can be done at any time through the creation of multiple instances.

Three major components make up a centralized data store:

1. Organization data—used to maintain information about various types of organizations (customers, vendors, carriers and trading partners)
2. Contact data—used to maintain information about names, addresses and contact information (telephone numbers, fax numbers and E-mail addresses)
3. Site data—used to track locations (central offices, customer offices and points of presence)

It is also essential that marketing and sales views are linked, or mapped, to an engineering view. For example, sales and marketing might offer a product branded "Commercial Internet." This product could include numerous services and elements grouped under the one label. The OSS must spawn all the actions and coordinate all the pieces that make up that service when a customer places an order called "Commercial Internet."

Configurability is the key. The ability to bundle services into a service offering is best supported by defining the underlying data so that it mirrors the technology (DSn, OCn, DSL, ATM, Frame Relay, etc), as opposed to directly tying it to a specific or hardcoded service type. Defining the data in this fashion will place less demand on the OSS for

continual adaptation to market changes. Service offerings can be rapidly created by simply combining or assembling the various technologies into a service bundle. As new technologies become available, they are modeled at the data layer. Once complete, one or more service offerings can be created without affecting existing offerings, entry screens, workflows, and business rules.

The DSL scenario in Figure 1 and Figure 2 used the example of an end-to-end workflow. In an ideal situation, automated OSS would go beyond this. When we speak of workflow from end to end, we mean a complete order fulfillment process internally automated, as well as automation at the level of gateways to carriers and customer self-service, with real-time billing and real-time network usage data. Customer access to self-service can be provided over Internet, phone line or kiosk. At all levels, the process and data-exchange are transparent to the user.

In the ideal situation, flow-through would extend from telecommunications service provider to provider with ease because all players in the industry would be using the same standards. The gateways connecting them would function seamlessly without the need for expensive, time-consuming customized solutions or manual data entry. Although numerous players are presently building towards this ideal, this level of automation has not yet been attained in the OSS industry.

Ultimately, telecom OSS with end-to-end flow-through can ensure quick and efficient service provisioning of DSL or any other service for CLECs or other telecom service providers. With widely agreed upon standards, new technologies constantly appearing, smarter OSSs and the competitive environment to drive innovation, the future looks promising for the telecom OSS industry.

References

Technology Research Institute. 1999. The Market for Telecom IT Solutions.

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Eftia is a leader in developing, deploying and managing OSS products designed to meet the service management and delivery needs of tier one, wireless and next-generation service providers.

The Eftia Master.Scribe® Suite of integrated OSS products provides comprehensive order provisioning and fulfillment; problem management; telecom circuit and asset inventory management; and Internet protocol (IP) address and telephone number management. Eftia also offers Master.Xchange, a configurable OSS interconnection gateway.

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