

A Technical
Perspective
White Paper

June 2002

CPXE

A Consumer
Digital
Photography
Industry
Initiative

*“Solving Problems,
Enabling Growth”*



© 2002 International Imaging Industry Association (I3A). All rights reserved.

I3A is a trademark of International Imaging Industry Association. All other trademarks are the property of their respective owners. The names and/or trademarks of the CPXe members and members of I3A may NOT be used in advertising or publicity pertaining to this document or its contents without specific, written prior permission.

This white paper may be reproduced and distributed freely provided that the above copyright notice is reproduced in its entirety.

About the CPXe Initiative Group

The CPXe Initiative Group was formed in January 2002 and consists of the following member companies: AGFA-GEVAERT, Canon USA, Digimarc Corp., Eastman Kodak Co., FotoWire, Fuji PhotoFilm-Hewlett Packard Corp., LifePics Inc., Olympus America, OpenGraphics Corp., and Pixology Ltd. Support provided by Gaiatec Services.

About I3A

I3A is the leading global imaging industry association, driving growth of, and setting standards for the photographic and information imaging markets. As the industry focal point, I3A offers a framework and environment where members can quickly find resources to solve critical issues and develop market solutions. Members of I3A work together to find common ground for advancing the industry and to enable better products and services for their customers. With almost 60 years of combined imaging industry leadership, I3A is the product of the merger of the Digital Imaging Group (DIG) and the Photographic and Imaging Manufacturers Association (PIMA). Further information about I3A is available at <http://www.i3a.org> or by contacting I3A at info@i3a.org or 914-698-7603.

Contents

1	Executive Summary
1	Audience
2	The Need For CPXe
2	Consumers Need Help
2	Businesses Need Help
3	What is CPXe
5	Types of CPXe Members and the roles they play
5	Top Level Architecture
7	CPXe Applications
8	The CPXe Directory
8	CPXe Services
9	Access Service
9	Fulfillment Service
10	Storage Service
11	Service Locators
12	Aggregate or Cascading Services
13	Catalogs
13	CPXe entity interactions
14	Helper Services
16	CPXe Membership
17	Payment and Settlement
17	Pay for Service
18	Referral Fee
18	Security
19	CPXe APIs
20	CPXe Standards
20	CPXe Service Interfaces
21	Image Transport
21	Consumer User Interface Redirection
22	Summary
23	Glossary

Executive Summary

The Common Picture eXchange environment (CPXe) is a digital photography industry initiative to grow the consumer digital photo services category. It will enable participating companies to offer significant new value propositions to consumers. Stated simply, it will allow consumers to get prints and other digital services using:

- any digital camera,
- from any location,
- with any online photo site, and
- with any retail printing service or local printer.

Foremost, this translates to the ability to get prints from digital cameras with ease and convenience. Ultimately, CPXe is about giving consumers the same convenience and choices as the current film based system, while adding all the advantages of digital.

This is made possible through the two core elements of the initiative:

- creating a Master Service Directory (similar to the “Yellow Pages”) to allow those services to be dynamically discovered and used, and
- creating standards for application and service interoperation on both a technical and commercial level.

The result is a Network that builds bridges between businesses, lowering the costs and overhead for partnership. The Network creates an environment that supports fluid transactions between them on a large scale. For consumers, the Network lowers barriers, giving them access to services they need wherever they need them so that digital photography becomes a fun, hassle-free experience.

To participate, companies will register applications and services.

Audience

This White Paper provides an overview of CPXe from a technical perspective, defining the roles of CPXe service providers and requestors, the components found in its architecture and their function, the mechanisms used to support requests between components, and the standards that used.

The goal of this document is to sufficiently explain the overall concepts of CPXe, so that the technical community can determine the implications and opportunities created by this initiative as it relates

to their current and future technical and commercialization activities. As a result, modifications, and refinement proposals are expected that will enhance the overall quality of this paper, the initiative, and other activities that interact with the CPXe program.

For a description of the business benefits to be gained from utilizing the CPXe Network and illustrations on how consumers benefit, please refer to the CPXe Business White Paper.

The Need For CPXe

The consumer digital photography industry has the potential for substantial growth. Yet, today several factors are standing in the way, slowing the growth rate. These factors can be understood from the perspectives of both consumer issues and business issues.

Consumers Need Help

Today, many consumers are ignorant of the benefits of digital photography. Many who know of its existence still see it as something “high tech,” complex, and with limited usefulness – good for emailing, but not capable of producing “normal pictures.” In particular, there is low awareness that traditional prints – the kind they expect from film – can be made from digital pictures.

Those who do understand its potential benefits are frustrated. Their experience of the digital photographic system is fraught with difficulties. In particular, it is not obvious how to get prints in a simple manner, or how to access and take advantage of other digital imaging services. Printing service infrastructures are not widespread. Awareness of digital imaging services is low. Solutions that do exist are closed and therefore often limited in terms of access and features.

Businesses Need Help

Many players in the industry are aware of these problems. Yet, industry conditions are causing them to be exacerbated, not addressed. By and large, each participant has to go it alone, trying to solve the problems single-handedly. A direct result is that each solution is incompatible with the next, built without standards. Solutions become “siloed”, and incapable of interacting with one another. Partnerships are made more difficult.

This, too, translates to slowed growth. Participants are required to invest in parts of the value chain that are not within their core

competences. Additional resources are needed, mistakes are inevitably made, and deployment is slowed. Would-be third party innovators in specific aspects of the value chain are locked out. Perhaps worst of all, the consumers are not well served. Ultimately, they experience barriers instead of access to the services they desire. What they would prefer is a fluid marketplace that serves their needs at any time or place – whether at home, on the road, or on vacation – without limiting their possibilities.

What is CPXe

CPXe is an architecture that links digital devices (e.g., cameras), Internet storage and printing, and retail photo finishing together. It provides both technical specifications and the business mechanisms that allow the system to work. It supports the ability for billing and payment information to flow around the system that gives economic incentives for participants to work together.

CPXe's primary interest is in providing opportunities for applications to interact with digital imaging services provided across a global network; specifically fulfillment, storage and sharing services.

These applications can be categorized into those that support Internet enabled devices (cameras, phones, pda's, frames,), kiosks, desktop software, web applications, and behind the counter applications like those found in mini-labs.

The services can be categorized into those that provide consumers with the ability to acquire products from digital images (fulfillment), access on-line storage, and sharing (together known as access services), those that provide other businesses with fulfillment and storage services, and service locators.

Applications communicate to these services through known interfaces.

The power of this architecture is found in the CPXe Directory Service layer. Mechanisms in this layer provide service providers a repository to publish their services, definitions, capabilities, and location. Given a set of services available through the CPXe Directory, applications can be created to implement new workflows by finding and utilizing these services. For example a desktop application can be written so that a consumer can upload images from home to an on-line provider, and create an order for prints to be made at the fulfillment lab located at a local retailer store, where neither the desktop software provide, the on-line service provider, nor the retailer are the same business.

CPXe takes advantage of the current industry movement toward providing services on the Internet, called Web Services and its

associated capabilities that provide service discovery, description, transport and environment. It takes advantage of SOAP, WSDL, and UDDI.

When combined these definitions allow:

- Service providers to define, develop, and publish their services using a commonly known interface description language (WSDL), and register them in a common directory available on the Internet (UDDI Server).
- Application providers to look for services that they need in these directories, acquire the description of their interfaces and implement interactions with them to provide added value to the consumer.
- Applications and services to communicate using well-known protocols (SOAP, HTTP) using service descriptions that can be generated by commercial development tools.

CPXe builds on this foundation by providing the interface definitions for the key services that are important to the digital image Industry, namely Access Service (consumer facing fulfillment, storage, and sharing) and B2B fulfillment, storage, and service locators, and by providing the additional infrastructure required for financial transactions to occur, in a secure fashion among registered CPXe companies.

These additions allow:

- CPXe service providers to develop access services, fulfillment, and storage systems that each abide by a well-defined interface. These services are published to the CPXe directory of services that is available to registered CPXe companies.
- CPXe application providers to develop software that utilize these common interfaces to create unique solutions targeted at providing the digital image Industry with new interoperability from home, on-line, and at retail locations, not previously possible.
- Additionally CPXe companies can provide Service Locators to apply business rules, consumer information, and service properties to filter the list of services in the CPXe directory to provide additional consumer benefit. For example, major retail chains can expose their retail store location database through a Service Locator to applications that want to find retail locations that are able to fulfill digital orders (i.e., fulfill in store).

Types of CPXe Members and the roles they play

Companies that are interested in participating in the CPXe network become CPXe members. A CPXe organization defines, manages, and maintains the process of creating new CPXe members in the network.

CPXe members can participate at different times in the initiative, either helping to define the business or technical specifications, or in creating and deploying application, or service that comply with these specifications.

Application providers are CPXe members that create, manage, and maintain applications that use services in the CPXe directory to provided extended capabilities to consumers.

An operator hosts and manages the central directory and membership services (hardware, software, and network). This entity acts on the behalf of the CPXe organization to manage the standard service definition entries in the directory (e.g., service API templates). It may be advantageous to have multiple hosting sites to insure the integrity of the network and maintain robustness.

CPXe members populate and maintain the CPXe directory. Every CPXe member has at least one CPXe member id, and all ids are unique (worldwide). That is, each business unit within a company may have a unique id. These ids, in association with the id's given to each service are used to identify members on the CPXe network when transactions are made between member components (e.g., when a CPXe application requests prints to be made from a CPXe fulfillment service). More than likely these ids will be associated with a company's legal business entity, rather than just at the parent company level.

Members manage and maintain their own business entity information, business service descriptions and binding information in the CPXe directory.

Service Providers are CPXe members that host CPXe-compliant services like Access Service, Storage, Fulfillment, or Service Locators whose definitions are entered in the CPXe directory.

Top Level Architecture

CPXe, at its highest architectural view, defines three major component levels: Application, Directory, and Service.

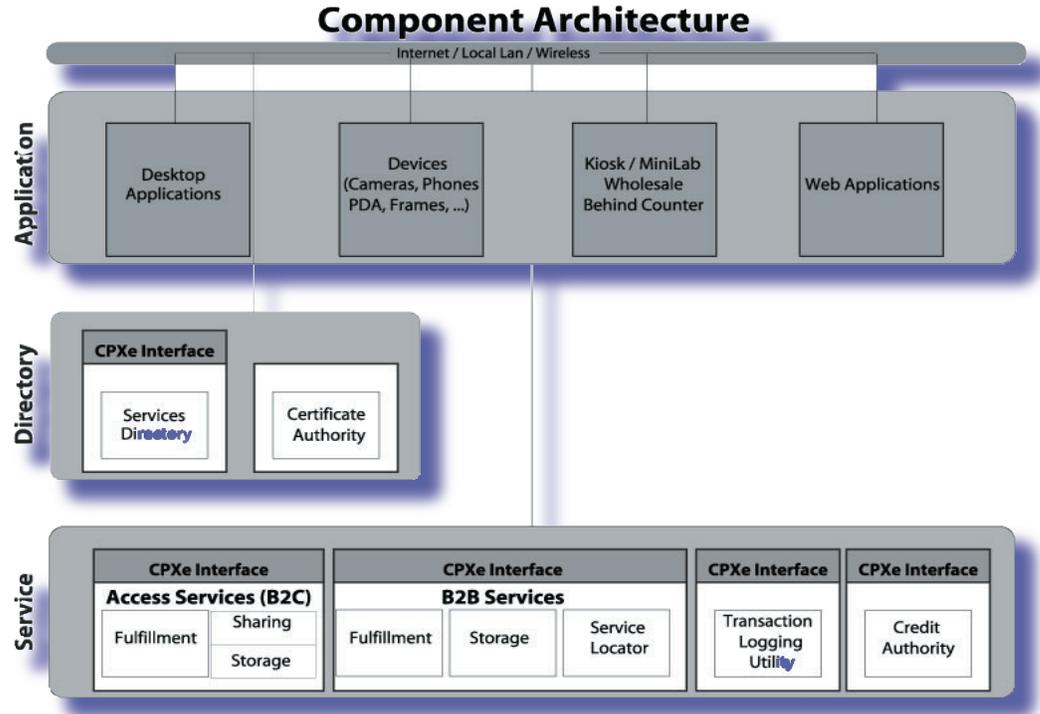


Figure 1.0 CPXe Component Architecture

CPXe Applications take advantage of CPXe services and provide consumers access to their images and fulfillment opportunities across in-home, on-line, and in-store environments. Each of these applications environments can provide unique and custom interactions with CPXe Access, Fulfillment, Storage Services, and Service Locators.

The CPXe Directory provides a common facility available to all CPXe entities to locate desired services. The Directory provides information about the owner of the service, its interface definition, and its location on the network.

Services that interact with consumer information may have associated applications that present their own User Interface to the consumer. These services will also have full capabilities to service requests directly from other CPXe applications that may want to provide all the consumer interactions without any assistance from the application associated with the service.

Registered CPXe companies provide CPXe Services, especially the key digital image Industry services of Access, Fulfillment, and Storage. Each of these major service types presents the same API to other CPXe applications, and services. Although the interfaces to these services are

common, the products and capabilities that they offer (e.g., 4x6 prints, greeting cards,) are specific to the service, as are the costs associated with providing the service to a requestor. The products a service offers, their prices, and their availability (e.g., 1hour processing) are elements of the catalog provided by each service.

CPXe Applications

CPXe applications are those that are provided by a CPXe member. CPXe applications can take the form of a desktop application, a kiosk application, an application in a device like a cell-enabled camera, a web-based application, or an application on a device that may be behind a retail counter, such as a mini-lab.

Consumers interact with application clients that run on client platforms. Devices can be connected to client platforms and can be controlled by application clients. Client platforms are connected to the Internet. As devices are able to connect to the Internet directly (e.g., Cell phone enabled camera) their internal applications may be capable of becoming CPXe enabled.

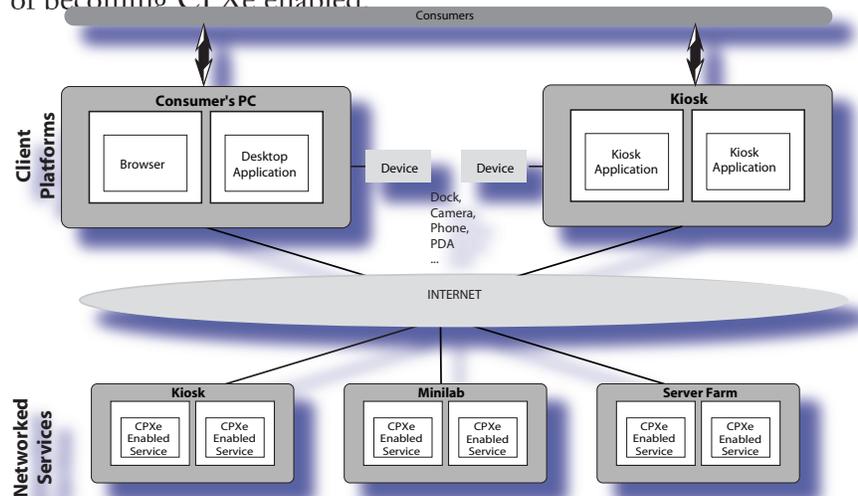


Figure 2.0 CPXe Applications

Although there may be many CPXe applications that are totally integrated, and provide the total consumer interaction, an application that one provider supplies may also be augmented by the application provided by another CPXe member. That is, services such as such as Access service may have associated applications that provide user interfaces, and may be called from another application like a desktop, each interacting with the consumer to provide their specific value.

The CPXe Directory

The CPXe Directory is a mechanism for housing information about CPXe members, applications and services. It contains sufficient information to properly describe the services provided by CPXe members so that application developers can understand their capabilities, and interfaces.

Applications can dynamically locate services by either interacting with the Directory itself, or by using another service called a Smart Locator. A Service Locator applies specific business rules to its search through the CPXe Directory for services, with information obtained by the consumer, and properties obtained from services, for example “find all the available Fulfillment Service Providers that are local to my area”.

As CPXe services only interact with other CPXe entities, the CPXe directory may be open to the public for viewing, but only CPXe members can make entries into the CPXe directory, and only CPXe member applications and services can interact with one another.

The CPXe Directory contains:

- Descriptions of the businesses that own the application or service
- Descriptions of the definitions of the interfaces to the CPXe defined services (e.g., Fulfillment, Storage, Access Service, Service Locators, and others).
- Entries that describe specific instances of services that business have provided, and how they can be accessed

It is anticipated that in the future for purposes of robustness, it is likely that the CPXe Directory will be hosted at multiple locations, where each location will provide access to all CPXe entries. Fail-over to the other hosting sites must be supported by the hosting services. Additionally each hosting site must interact will all other hosting sites to synchronize and keep accurate the Directory content.

CPXe Services

The main CPXe Services are:

- a) Access
- b) Fulfillment
- c) Storage
- d) Service Location

Each service class has its own defined and common interface. The Access service is classified as a B2C Interface as it is responsible for interacting directly with consumer information. Both the Fulfillment and Storage Services are classified as B2B interfaces as they only interact with other applications or services, and do not provide any mechanisms to interact directly with the consumer.

Access Service

The Access Service provides three major consumer oriented services: fulfillment, storage and sharing. It may include order management, credit card authorization and settlement, tax calculation, etc. This services interface allows the consumer to “order” fulfillment (e.g., buy prints), store and share assets (like images). Typically these interactions are associated with a consumer membership (although not required). For instance a consumer may create an account at an access service so that future interactions can take advantage of cached consumer information. Likewise when images are stored, they will be associated with a consumer account. In other words, consumers are provided “access” to these personalized fulfillment, storage and sharing services.

The application associated with this service class is typically provided by the provider of the service and would be responsible for interacting with the consumer, (for example when e-commerce is involved in taking an order). Specifically, this application provides the shopping experience to the consumer, relating brand, pricing, tax, and catalog information to support a purchase being made, and collects order, consumer, payment, shipping, and billing information from the consumer. Other application characteristics like promotions, announcements, product configuration, help, and FAQs, for example, are all potential parts of this application environment.

It is expected that the application associated with the access service is either invoked directly by a consumer (e.g., the consumer goes to a specific URL from their browser), or the consumer is redirected to it by another application (like a desktop or kiosk). For example, a Web site may present a page to its client suggesting that Digital Print Services are available by clicking on a button. When the consumer clicks the button, they are redirected to an on-line digital print providers' Web site.

Fulfillment Service

The CPXe Fulfillment Service provides its service requestors with a B2B interface. This service takes orders primarily for Digital Image

Fulfillment, but may also support other related merchandise items (like frames). This service provides no direct user interface to the consumer.

This service accepts fulfillment orders in a form where the entire order is delivered in one interaction.

The main interfaces are:

1. Obtain and set properties of the service
2. Place an order
3. Obtain or modify properties of an order

A service requestor can query the Fulfillment service for its capabilities, where the service will respond with catalog information, and service capabilities (e.g., ability to ship partial orders).

This service does NOT provide the notion of a Consumer Order Repository, in that the service requestors must keep the copy of the consumer's order to provide "order history" capabilities.

Once an order is placed, a service requestor uses the Order Properties interface to determine the status of an order. It may also change the status of an order (e.g., cancel or pause/resume), if the service supports these capabilities.

This service also supports multiple methods of acquiring the images in the order:

- Pushed from the requestor
- Pulled from an online service (e.g., web service)
- By reference to images in a CPXe-compliant Storage service

Storage Service

The CPXe Storage Service provides its service requestors with a B2B interface. This service takes orders to store or retrieve digital assets, in a hierarchical fashion (e.g., groups). It is expected that a storage service will partition access to the assets minimally by CPXe member, then by the service requestors' consumer identifier.

The CPXe Storage Service manipulates assets. An asset is a generalization meant to represent a digital image, or a group of digital images, but can also represent an audio file, a video file, etc. The Storage service supports the concept of groups, which are simply named

containers of assets. A general method for associating properties to assets is also supported.

The Storage service is meant to be a repository for digital assets that may have originated from:

- Digital media uploads from consumers (e.g., digital cameras or scanners from home or retail kiosks)
- Uploads resulting from the digitization of film or existing prints from:
 - Kiosks
 - Behind the Counter Equipment
 - Mini-Labs
 - Wholesale Equipment

The interface to the Storage Service allows the service requestor to:

- Add, Copy, and Delete Assets
- Retrieve and List Assets, and
- Get and Set Asset Properties
- Query Storage Service properties (e.g., storage space available, ...)

The CPXe Storage Service definition provides for the opportunity for the service requestor to retrieve image assets at the requested resolution. This is particularly important to provide a view into a consumer's image storage through an application's user interface.

Service Locators

As more services are populated into the directory, it's clear that there will be a need to provide applications a service that assists in the filtering of the available services given some criteria. Service Locator services, and their associated applications will be provided to apply business logic, consumer information, queries against the directory, and information obtained from services to better facilitate a consumer's request for services.

A CPXe Service Locator is itself a service and is listed in the directory with all other services.

The specific rules that a Service Locator applies to the directory of services are augmented by responses made by a consumer in the application associated with that Service Locator. As well, a calling application may interact with the consumer directly, and provide the resulting responses to the Service Locator service in a programmatic fashion. For instance, a Smart Locator service could be called upon to find the list of retail locations available for in-store fulfillment. In this case the application associated with the Service Locator service may present a list of questions to the consumer, and search the directory in response to their input, utilizing its own business rules, catalog information obtained from services, and other databases available to it.

For example, this application may present a User Interface to the consumer indicating that it can list retailer fulfillment locations, but requires the consumer's zip code, area code, street address, starting and ending address of a driving route, or another series of choices that the consumer can utilize. Depending upon the selection, the service requestor, the business rules available to the locator service, catalog information available from the services, and the entries in the directory, the Service Locator will determine the list of applicable services that the application can present to the consumer. The consumer can choose an entry, or continue searching.

The Service Locator service returns the selection to the service requestor.

Aggregate or Cascading Services

It's anticipated that some services like the Access Service may take advantage of several other B2B services like Storage and Fulfillment. In these cases, that Access service would appear to its service requestor as having more capabilities than it by itself provides. In other words it becomes an Aggregating service. That is, it takes advantage of several other types of services and represents their capabilities as its own.

As well, some services like fulfillment may cascade in a form where a fulfillment service may take advantage of other fulfillment services to expand the portfolio of products that it offers. For example, a fulfillment service that is provided by a CPXe provider that manufactures 4x6 prints, may take advantage of another fulfillment service that offers gifts to expand its portfolio and appear to the service requestor as being able to provide both prints and gifts.

Catalogs

All Service Requestors and Service Providers have catalogs. Service Providers provide catalogs to Service Requestors containing product and service information and pricing. There is typically a standard provider catalog that contains their complete set of products and services along with their 'list prices'. Providers can also establish specific catalog instances containing only the products and services and pricing for a particular requestor.

Service Requestors have a catalog that they provide to Service Providers. This catalog contains referral fee information. The same rules that apply to service provider catalogs also apply to referral fees.

Service Requestors may also have consumer catalogs. These catalogs contain the products being offered to the consumer and their associated retail pricing.

Catalogs must support multiple languages, currencies, ship to countries, and shipping methods. It must be possible to get catalog information in the desired language and currency, with the appropriate ship to country and shipping method information.

There must be a mechanism for classifying products and services such that Service Requestors and Providers can understand and compare catalog information from multiple services. There must also be a common communication mechanism for providing the information, and a common mechanism for identifying products. All of these mechanisms should be based on existing commercially available products and/or standards.

CPXe entity interactions

The interaction between CPXe entities can be represented as illustrated in Figure 3.0 as a relationship between a Service Requestor, the Directory and a Service Provider. As services aggregate or cascade, a CPXe entity can change roles from being a Service Provider to being a Service Requestor. Consider the example of a Print Fulfillment service representing a product portfolio in its capabilities, where in fact some of the products it offers are outsourced to another fulfillment provider.

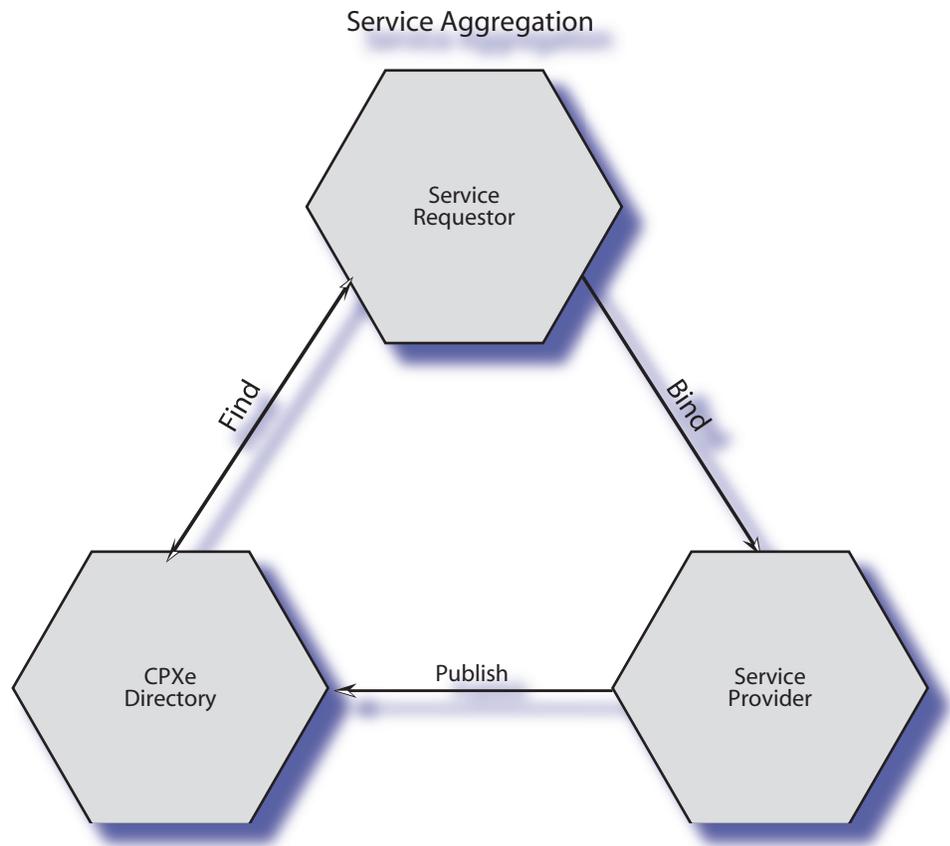


Figure 3.0 Service Delivery Roles

Helper Services

CPXe interactions are based on a trust model between requestor and provider pairs. This relationship manifests itself in two ways:

Identification – In order for service providers to interact with service requestors, they need to know that the requestor is a valid and current CPXe member, and that they are a business the provider wants to service. Service requestors will always, as part of the request to the service providers, identify themselves by securely passing their CPXe identification. The CPXe service can then validate the requestor's id, by interacting with the CPXe Certificate Authority. The Certificate Authority provides certificates to CPXe members. These certificates are used to provide a means to authenticate members and to digitally sign portions of the data content exchanged between service requestors and service providers.

Credit Worthiness – Typically a request for service is offered and implemented with the assumptions that the service will deliver revenue to the provider. The service provider may have an apriori agreement with the service requestor, and knowing the service requestor through

its member or service id, grants the requestor service. Alternatively, the service provider may require additional information about the service requestors Credit Worthiness. Although complex models can be created to define the relationship between multiple aggregating or cascading participants (e.g., transaction fee, new member finder fees, portal fees,), CPXe confines those types of business interactions to cooperating pairs (i.e., requestor / provider). So that each party has the ability to track its financial obligations, chargeable transactions are logged. It's anticipated that in time service requestors will want to utilize services found in the directory without having first created a contractual relationship. It is therefore anticipated that the service provider will need dynamic methods to determine whether it will honor the request or deny service. Two services need to be considered when this type of interactions is required:

Credit Rating Service – This set of services aids a service provider in determining whether to accept or reject a request for service based on a third parties appraisal of the requestors financial condition and credit worthiness. The service provider may choose to interact or not with the service requestor based on the Rating determined by this service. A service requestor provides an API to the service provider that returns the identification of the Credit Rating Service, and sufficient information for the Service Provider to acquire a service requestor's credit rating.

Credit Guarantor Service – This set of services basically guarantee payment to the service provider of services requested. The identification of the Credit Guarantor Service is made available to the service provider through an exchange between the requestor and provider. An example of this type of service is a Credit Card processing service, where the service requestor has already made arrangements with the service; for instance has acquired a corporate credit card. In this example the service is charged to the service requestor's corporate credit card when it is rendered. See Figure 4.0.

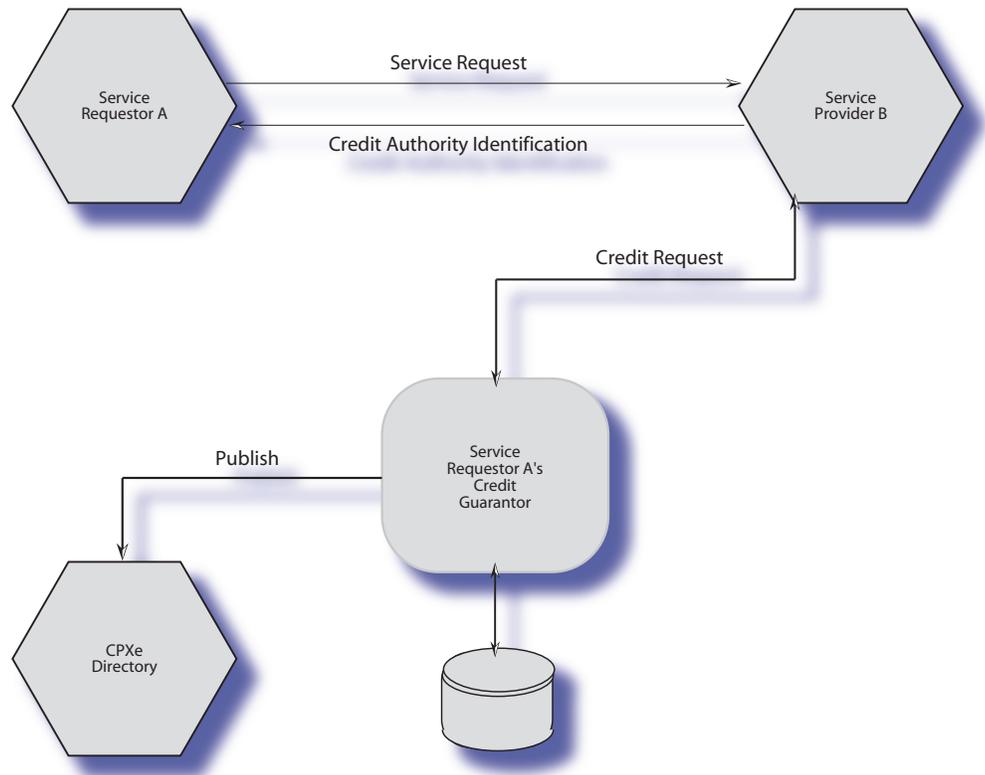


Figure 4.0 CPXe Services – Credit Guarantor

The service provider does NOT need to interact with these services for every request. For instance, two companies may determine that it's beneficial to have a direct business relationship, and the service provider may determine that its service will recognize the requestor's id, and not pursue any other Credit Authorization mechanism.

CPXe Membership

Businesses that are interested in participating in CPXe as either application or service providers require membership in the CPXe network. This membership provides the system the information necessary to properly support the mechanisms of authentication, service location, and credit worthiness. Membership is required for applications and services to interact, and is a key requisite to the operational characteristic of the network.

Unlike business membership, CPXe does not require consumers to be members of the CPXe network, and there is no notion of a common name space for consumer membership across CPXe. It is anticipated that each Access service will provide consumer membership services, if appropriate (i.e., it's anticipated that some services will provide

workflows for guest purchases).

Payment and Settlement

As was noted earlier, the Access service is responsible for consumer-based services. It should also be clear though that it is not necessary for a consumer to be presented an e-commerce interaction. For instance, the on-line placement of a consumer order for fulfillment, where the consumer pays for the order across a counter at a retail location, is quite valid.

However, in all circumstances, the transactions that occur between a service requestor and a service provider will carry sufficient information so that payment and settlement between CPXe members can be accomplished. Payment for service, and Referral Fees are the two currently identified methods that CPXe members used to transact business.

Pay for Service

This interchange can happen either in-band, or out of band. An out-of-band interchange is the most likely and will initially be the most common, where the service provider sends an invoice to the service requestor for payment for services (e.g., rendering of wholesale fulfillment orders). In-band refers to the situation where a credit card transaction is used to pay a service provider. Note that this credit card is the credit card of the CPXe Service Requestor, not the consumer.

The CPXe interfaces support the interchange of transaction information for both the service provider and the service requestor to maintain records of the financial transaction. The interface provides the opportunity for a service requestor to identify the location of a logging utility to capture the receipts for its transactions. This is helpful when the service requestor is not capable of logging the receipt (for example a kiosk, or a desktop application). See Figure 5.0.

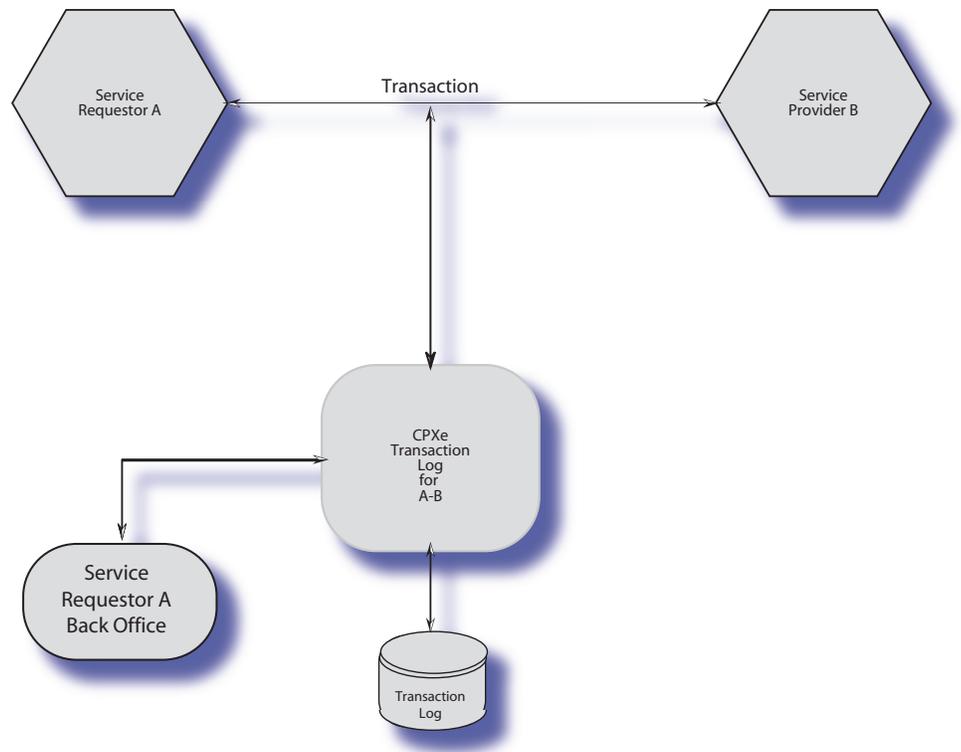


Figure 5.0 CPXe Services – Transaction Logging

Referral Fee

Here the service provider is expected to provide a payment to the service requestor for bringing business to the service provider. Typically, an invoice will be sent to the service provider by the service requestor, after the service provider produces a “requestor” specific report and sends it to the service requestor. This process is necessary to support companies that are not able to support a transfer of funds without an invoice.

Security

The following qualities will be built into the API’s of the CPXe services:

Authentication – insures the service requestor is really who they say they are. Provided by the use of digital certificates.

Authorization – insures that the service requester has the right to utilize a service. It's expected that this can be accomplished either by providing business relationship information in the directory as a paired agreement, or simply by having a service look up in its internal database whether the service requester is know, and therefore whether to provide service.

Privacy – insures that the data transmitted between a service provider and a service requester is not disclosed to others. Interactions between service requestors and service providers will be over SSL.

Data Integrity – insures that the data sent between a service requester and a service provider is not altered. Sensitive data will be digitally signed.

Non-Repudiation - a mechanism that provides proof of the integrity and origin of data, both in an unforgeable relationship. It is anticipated that the request for service and the service receipt will be digitally signed.

CPXe APIs

Applications find value in being able to find and interact with CPXe services through the Directory and Service Locators, in that services of the same type (e.g., storage) provide a consistent interface. CPXe APIs can be modeled as shown in Figure 6.0 and discussed below.

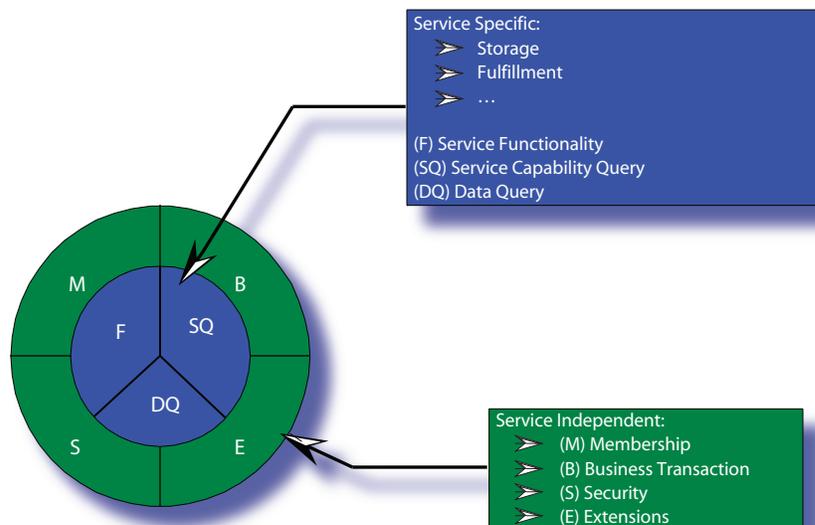


Figure 6.0 CPXe API Structure

Service specific functionality (e.g., storage): These API's are consistent among services of the same type, but differ from service type to service type. This portion of the API specifies:

(F) the functionality of the service (e.g., save an asset)

(SQ) a query mechanism to determine the capabilities of a specific instance of a service (e.g., can this fulfillment service ship to a specific country)

(DQ) a query mechanism to determine the state of data housed by the service (e.g., order status)

Service Independent functionality: This information is carried between a service requestor and a service provider in a consistent form across service types.

Membership: Identifies the Service Requestor and Service Provider.

Business Transaction: Identifies the type of transaction, and the associated fee types if any.

Security: Supports authentication, privacy, and non-repudiation when required.

Extensions: Service instantiation specific capabilities. Extensions to the common interface can be made by service providers so that specific implementations of a particular service can offer value-added capabilities beyond those provided by the standard interface.

CPXe Standards

CPXe takes advantage of the existing computer industry trend called "Web Services" in its utilization of core technologies, standards, and tools. These include http, XML, SOAP, WSDL, and UDDI.

Although these specifications provide a broad platform for interoperability, they do not provide sufficient support for CPXe, specifically in the areas of security, versioning, and business transactions. It is anticipated that the Web Services efforts will address these issues in time, as they are now being discussed, but CPXe may have to select a particular direction on each of these topics prior to the solutions becoming publicly available through these efforts.

Primarily, CPXe interfaces are based on three primary exchanges:

CPXe Service Interfaces

- CPXe Service Interfaces are described in WSDL – Web Services Definition Language
- SOAP – Simple Object Access Protocol to exchange requests and responses between service requestors and service providers.

Although WSDL provides for multiple bindings, CPXe API's minimally require a SOAP binding. Others may be also be supported by CPXe Service Providers.

- http – Hyper-Text Transport Protocol to transport the requests/response

Image Transport

- CPXe uses http to move images between requestors and provider. It is expected that images will be transferred over a non-secure transport (e.g., http, not https).

Consumer User Interface Redirection

- CPXe applications are found in internet capable device, desktops, or web environments. As one application wants to redirect a consumer to another application, it's most likely that the consumer will be redirected through a browser to an on-line web application. This will be done through http.
- Directory - The CPXe Directory will leverage the existing work being done on the UDDI Server – Universal Description, Discovery, and Integration, lead by uddi.org. This interface defines the mechanisms to both publish, and find directory entries.

Summary

CPXe provides the Digital Imaging Marketplace a set of services that provide consumers with convenience, choice, and access to their images and fulfillment services from home, on-line, and at store. The CPXe Architecture provides CPXe member companies the required tools and business infrastructure to create digital imaging solutions. Specifically, the CPXe architecture solves:

- The need to define a common interface to key digital imaging services so that service requestors can interact with services provided by different suppliers in a consistent fashion – Common Interface.
- The need to determine a mechanism for service providers to extend the common interfaces providing instance-specific capabilities – Extensions.
- The need to define a security mechanism for service requestors and service providers to interact – Security.
- The need to define a method to find services and service providers allowing other CPXe member companies to construct business arrangements to use these services and link to them dynamically – Directory.
- The need to define a method for service requestors and service providers to record their interactions so that service payments and referral fees can be made – Transaction Logging.
- The need to provide a mechanism to assist in the run-time filtering of services listed in the directory according to consumer input and business rules, and information obtained from services – Locator Services.
- The need to publish these interfaces in a form that allows input from external business and technical community so that their needs are incorporated – Published Specifications.
- The need to provide a framework for these capabilities based on industry standards and initiatives – Framework based on standards.
- The need to provide a mechanism whereby applications, and service providers can be identified to each other – Membership.

Glossary

- B2B Interface Model - In this interface model, the CPXe service interacts directly only with a CPXe application or another CPXe service via a programmatic API.
- B2C Interface Model - In this interface model, the CPXe application interacts directly with the consumer via a graphical user interface. All applications by definition utilize this interface model.
- Consumer - The group or individual who engages with a CPXe application.
- CPXe Application - An Internet-enabled application that conforms to the CPXe architecture. Applications are the parts of the CPXe environment that interact with consumers who wish to utilize digital imaging services.
- CPXe Application Provider – Companies that create applications that utilize other CPXe applications or services.
- CPXe organization– CPXe governing body.
- CPXe Member – A CPXe Application Provider, Service Provider, or Operator. A CPXe member has agreed to abide by certain rules, licenses, principles, and policies.
- CPXe Operator – Hosts and operates an instance of the CPXe Directory.
- CPXe Service Provider – CPXe entity that provides services to CPXe Requestors.
- CPXe Requestor – CPXe entity that is requesting services from services listed in the CPXe directory.
- CPXe Service - An Internet-enabled service, which conforms to the CPXe architecture. CPXe services provide business processes that are ready to interact with CPXe applications or other CPXe services to provide complete digital imaging solutions to consumers. CPXe services of the same class (e.g., storage) provide a common API.
- CPXe Service Provider – Companies that provide CPXe Services like Access Service, Service Locator, Storage, and Fulfillment.
- HTTP– Hypertext Transfer Protocol – see <http://www.w3c.org/protocols/>
- SOAP – Simple Object Access Protocol – see <http://www.w3.org/TR/SOAP/>
- UDDI– Universal Discovery, Description, and Integration of Business for the Web. – see <http://www.uddi.org/>
- W3C– World Wide Web Consortium – see <http://www.w3.org/>
- WSDL – Web Services Definition Language – see <http://www.w3.org/TR/wsd/>
- XML– Extensible Markup Language – see <http://www.w3.org/XML/>