Microsoft Dynamics AX

Implement a payment connector and a payment device

This document explains how to implement a payment connector, a payment accepting web app, and a payment device to handle various payment processing scenarios.

White paper

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Part 1: Implementing a payment connector

Currently, the payment connector is built as a portable class library by using C# profile 111. Therefore, the connector can work on the following platforms: the Microsoft .NET Framework version 4.5, Windows 8, Windows Phone Silverlight 8, Windows Phone 8.1, Xamarin.iOS, and Xamarin.Android. The same connector supports the following channels:

- Microsoft Dynamics AX (Direct marketing)
- Microsoft SharePoint with the Microsoft Dynamics plug-in (E-Commerce)
- Mobile & Desktop POS (Retail)

Originally, the payment software development kit (SDK) encrypted each payment property individually, depending on the **SecurityLevel** setting. However, this functionality is being phased out, and all merchant data will now be encrypted at rest by the clients.

Each call to the payment connector application programming interface (API) follows the same request and response pattern. The request holds the required locale for any messages and the payment property array of data to carry out the operation. The request payment properties are grouped by four main namespaces: **MerchantAccount**, **TransactionData**, **PaymentCard**, and **Connector**. The response holds the locale of the messages and the payment property array of data that is produced by carrying out the operation. It can also hold an array of errors that occurred while the operation was being processed. The response payment properties are grouped by three main namespaces: **MerchantAccount**, ***Response** (where ***** = **Authorize**, **Capture**, **Void**, **Refund**, and so on), and **Connector**.

The ***Response** namespace is held as a **PaymentProperty** property that contains an array of **PaymentProperty** properties. Therefore, it's much easier to generate any dependent requests, such as a capture request from an authorization response.

Many operations require data from the previous response. Therefore, all clients copy the response property bag and combine it with the next dependent request call. This functionality lets each payment connector developer save data that is required for subsequent calls.

Make sure that any exceptions that occur in the payment connector are mapped to the response errors, because exceptions aren't allowed to bubble up to the calling client. Instead, the payment SDK logs them by using NetTracer.

A sample project has been created as a template for creating new payment connectors to link to different payment providers. Use this document and the sample to create your connector.

Payment scenarios

Before we get into the details of payment APIs, this section presents the basic payment scenarios. Each scenario consists of a list of steps. Some steps invoke payment APIs. These steps will help you understand how payment connector APIs (in this part of the document) and payment device APIs (in part 3) are used in those scenarios.

Note: This section doesn't present a complete list of the scenarios.

Set up a merchant account

You can set up a merchant account in Accounts receivable in Dynamics AX (used by the call center), in a hardware profile (used by the point of sale [POS] in stores), and in an online channel (used by the E-Commerce website).

1 Add a new merchant account.

   Method invoked: IPaymentProcessor.GetMerchantAccountPropertyMetadata

2 Fill in the merchant information.
3 Validate the merchant account.

   Method invoked: IPaymentProcessor.ValidateMerchantAccount

4 Save the merchant account.

Process a call center order (Dynamics AX)

1 Create a new call center order.
2 Add a customer, add products, and so on.
3 Click **New credit card**.

   Method invoked: IPaymentProcessor.GetPaymentAcceptPoint (The inputs are the transaction type, merchant, industry type, and so on.)

4 Fill in the card information and amount, and then click **OK**.

   Methods invoked:

   - IPaymentProcessor.GenerateCardToken (This method is called from the accepting page.)
   - IPaymentProcessor.RetrievePaymentAcceptResult (The result is a card token.)

5 Submit payment.

   Method invoked: IPaymentProcessor.Authorize (The token is used.)

6 Place the order.
7 Ship and invoice the order.

   Method invoked: IPaymentProcessor.Capture (The authorization response is used.)

Process an online order (E-Commerce)

1 Add a product to the shopping cart.
2 Start checkout, and select a shipping method.
3 Go to the payment page.
4 Click **Credit card**.

   Method invoked: IPaymentProcessor.GetPaymentAcceptPoint

5 Fill in the card information and amount, and then click **OK**.

   Methods invoked:

   - IPaymentProcessor.GenerateCardToken (This method is called from the accepting page.)
   - IPaymentProcessor.RetrievePaymentAcceptResult (The result is a card token.)

6 Place the order.

   Method invoked: IPaymentProcessor.Authorize (The token is used.)

7 Ship and invoice the order.

   Method invoked: IPaymentProcessor.Capture (The authorization response is used.)

Process a POS cash-and-carry transaction by using an accepting page

1 Start a cash-and-carry transaction.
2 Add products to the transaction.
3 Click **Pay card**.

   Method invoked: IPaymentProcessor.GetPaymentAcceptPoint

4 Fill in the card information and amount, and then click **Tender**.

   Methods invoked:

   - IPaymentProcessor.GenerateCardToken (This method is called from the accepting page.)
   - IPaymentProcessor.Authorize (This method is called from the accepting page.)
   - IPaymentProcessor.Capture (This method is called from the accepting page.)
   - IPaymentProcessor.RetrievePaymentAcceptResult (The results are a card token and a card payment.)

5 Print a card payment receipt.
6 Optional: Void the payment.

   Method invoked: IPaymentProcessor.Refund (The token is used.)

7 Submit the transaction.
8 Print a transaction receipt.

Process a POS cash-and-carry return by using an accepting page

1 Find the transaction to return.
2 Select the product to return.

3 Click **Pay card**.

Method invoked: IPaymentProcessor.GetPaymentAcceptPoint

4 Fill in the card information and amount, and then click **Tender**.

Methods invoked:

- IPaymentProcessor.GenerateCardToken (This method is called from the accepting page.)
- IPaymentProcessor.RetrievePaymentAcceptResult (The result is a card token.)
- IPaymentProcessor.Refund (The token is used.)

5 Print a card payment receipt.

6 Submit the transaction.

7 Print a transaction receipt.

Process a POS customer order by using an accepting page

1 Start a customer order.

2 Add a customer, add products, and select a delivery method, such as shipping all.

3 Click **Pay card for deposit**.

Method invoked: IPaymentProcessor.GetPaymentAcceptPoint

4 Fill in the card information and amount, and then click **Tender**.

Methods invoked:

- IPaymentProcessor.GenerateCardToken (This method is called from the accepting page.)
- IPaymentProcessor.Authorize (This method is called from the accepting page.)
- IPaymentProcessor.Capture (This method is called from the accepting page.)
- IPaymentProcessor.RetrievePaymentAcceptPoint (The results are a card token and a card payment.)

5 Enter a card for the remaining amount.

Method invoked: IPaymentProcessor.GetPaymentAcceptPoint

6 Fill in the card information and amount, and then click **OK**.

Methods invoked:

- IPaymentProcessor.GenerateCardToken (This method is called from the accepting page.)
- IPaymentProcessor.RetrievePaymentAcceptPoint (The result is a card token.)

7 Submit the order.

Method invoked: IPaymentProcessor.Authorize (The token is used.)

8 Fulfill and invoice the order.

Method invoked: IPaymentProcessor.Capture

9 Print a receipt.

Process a POS cash-and-carry transaction by using Microsoft Dynamics AX Retail Hardware Station

1 Start a cash-and-carry transaction.

2 Add products to the transaction.

   Methods invoked:

   - IPaymentDevice.OpenAsync
   - IPaymentDevice.BeginTransactionAsync
   - IPaymentDevice.UpdateLineItems

3 Click **Pay card**.

4 Fill in the card information and amount, and then click **Tender**.

   Method invoked: IPaymentDevice.AuthorizePaymentAsync

5 Print a card payment receipt.

6 Optional: Void the payment.

   Method invoked: IPaymentDevice.VoidPaymentAsync

7 Optional: Cancel an operation (for example, cancel the capture of a signature).

   Method invoked: IPaymentDevice.CancelOperationAsync

8 Submit the transaction.

   Methods invoked:

   - IPaymentDevice.CapturePaymentAsync
   - IPaymentDevice.EndTransactionAsync
   - IPaymentDevice.CloseAsync

9 Print a transaction receipt.

Process a POS cash-and-carry return by using Hardware Station

1 Find the transaction to return.

2 Select the product to return.

   Methods invoked:

   - IPaymentDevice.OpenAsync
   - IPaymentDevice.BeginTransactionAsync
   - IPaymentDevice.UpdateLineItems

3 Click **Pay card**.

4 Fill in the card information and amount, and then click **Tender**.

   Method invoked: IPaymentDevice.RefundPaymentAsync

5 Print a card payment receipt.

6 Submit the transaction.

Methods invoked:

- IPaymentDevice.EndTransactionAsync
- IPaymentDevice.CloseAsync

7 Print a transaction receipt.

Process a POS customer order by using Hardware Station

1 Start a customer order.
2 Add a customer.
3 Add products.

Methods invoked:

- IPaymentDevice.OpenAsync
- IPaymentDevice.BeginTransactionAsync
- IPaymentDevice.UpdateLineItems

4 Select a delivery method, such as shipping all.
5 Click **Pay card for deposit**.
6 Fill in the card information and amount, and then click **Tender**.

Method invoked: IPaymentDevice.AuthorizePaymentAsync

7 Print a card payment receipt.
8 Enter a card for the remaining amount.
9 Fill in the card information and amount, and then click **OK**.

Method invoked: IPaymentDevice.FetchTokenAsync

10 Submit the order.

Method invoked: IPaymentProcessor.Authorize (The token is used.)

11 Fulfill and invoice the order.

Method invoked: IPaymentProcessor.Capture

12 Print an order receipt.

Connector setup

Payment connectors are configured in Dynamics AX by opening the **Channel configuration** page, which dynamically loads all the connectors that implement the **IPaymentProcessor** interface in the connector directory. When the customer selects a connector, the page calls the **GetMerchantAccountPropertyMetadata()** method, which returns the metadata that is required in order to configure the connector. The following code shows the required properties.

Note: The text should be translated for the requested locale.

```
property = new PaymentProperty(
    GenericNamespace.MerchantAccount,
    MerchantAccountProperties.PortableAssemblyName,
    this.GetAssemblyName(),
    SecurityLevel.None);
property.SetMetadata("Portable assembly name:", "The portable assembly name of the test provider",
false, true, 0);
property = new PaymentProperty(
    GenericNamespace.MerchantAccount,
    MerchantAccountProperties.ServiceAccountId,
    Guid.NewGuid().ToString(),
    SecurityLevel.None);
property.SetMetadata("Service account ID:", "The organization subscription ID for Dynamics Online
Payment service", false, false, 2);
property = new PaymentProperty(
    GenericNamespace.MerchantAccount,
    MerchantAccountProperties.SupportedCurrencies,
    SupportedCurrencies,
    SecurityLevel.None);
property.SetMetadata("Supported currencies:", "The supported currencies (ISO 4217) for Dynamics Online
Payment service", false, false, 8);
property = new PaymentProperty(
    GenericNamespace.MerchantAccount,
    MerchantAccountProperties.SupportedTenderTypes,
    SupportedTenderTypes,
    SecurityLevel.None);
property.SetMetadata("Supported payment methods:", "The supported payment methods for Dynamics Online
Payment service", false, false, 9);
```

The **SetMetadata()** method sets the displayed text, tooltip, **isPassword** property, **isReadOnly** property, and display sort order. You can also change the height of the text box by setting **property.DisplayHeight** to **3** (to make it three text lines high) or even hide properties from the customer by setting **property.IsHidden** to **true**.

The merchant data namespace is used to store data that the connector always uses for every type of payment operation. This data includes endpoints, credentials, and merchant identifiers. Every request to the payment connector will include the full set of merchant properties. However, the response will include only the service account ID from the **MerchantAccount** namespace.

Connector validation

Before the Dynamics AX configuration page is saved, a call is made to the payment connector to validate the settings that the customer entered. The **ValidateMerchantAccount()** method is used. This method typically calls the endpoint by using the supplied credentials, and it validates that the settings are correct. If they aren't correct, the error that is returned is mapped to the closest generic error in the payment SDK **PaymentError** enumeration. For example, this generic error might be **ApplicationError**, **LocaleNotSupported**, or **InvalidRequest**.

GenerateCardToken method

The **GenerateCardToken()** method is used when the system must store a credit card in a secure manner for later use. In the main mode, the credit card data is sent to this method, and a token is returned. The following example shows the **GenerateCardToken()** method.

```
Response GenerateCardToken(request, null)
```

Here is an example of the request and response properties.

Request.Properties

Namespace	Property name	Example value
MerchantAccount	*	*
PaymentCard	CardType	"Visa" (**CardType** enum)
PaymentCard	CardNumber	"4111111111111111"
PaymentCard	CardVerificationValue	"999"
PaymentCard	ExpirationYear	2015
PaymentCard	ExpirationMonth	11
PaymentCard	StreetAddress	"One Microsoft Way"
PaymentCard	City	"Redmond"
PaymentCard	State	"WA"
PaymentCard	PostalCode	"98052"
PaymentCard	Country	"US"

Response.Properties

Namespace	Property name	Example value
MerchantAccount	ServiceAccountId	"<<GUID>>"
PaymentCard	CardType	"Visa" (**CardType** enum)
PaymentCard	CardToken	"<<Token>>"
PaymentCard	Last4Digits	"1111"
PaymentCard	UniqueCardId	"<<GUID>>"
PaymentCard	ExpirationYear	2015
PaymentCard	ExpirationMonth	11
PaymentCard	StreetAddress	"One Microsoft Way"

Namespace	Property name	Example value
PaymentCard	City	"Redmond"
PaymentCard	State	"WA"
PaymentCard	PostalCode	"98052"
PaymentCard	Country	"US"
PaymentCard	BankIdentificationNumberStart	"400000"
Connector	ConnectorName	"<<Connector name>>"

The **BankIdentificationNumberStart** property is optional. It contains the starting number of the card's BIN (Bank Identification Number). For example, the starting number for VISA is 400000, and the starting number for MasterCard is 510000. The property value helps the caller identify the card type.

Note: The caller might not understand the **CardType** property, because it's just a string that is determined by the payment connector. In these cases, the **BankIdentificationNumberStart** property helps identify the card type. Currently, this property is used only in payment accepting scenarios, when the payment accepting page doesn't send the card prefix.

In Dynamics AX, the client calls **Response GenerateCardToken(request, requiredInteractionProperties)**, where a Win32 dialog is displayed and the client enters the required details. This method is called only from Dynamics AX instances that run on the client's desktop.

Request.Properties

Namespace	Property name	Example value
MerchantAccount	*	*

requiredInteractionProperties

Namespace	Property name	Example value
PaymentCard	CardType	"<<**CardType** enum>>"
PaymentCard	CardNumber	""
PaymentCard	CardVerificationValue	""
PaymentCard	ExpirationYear	<<Default year>>
PaymentCard	ExpirationMonth	<<Default month>>
PaymentCard	StreetAddress	""
PaymentCard	City	""
PaymentCard	State	""
PaymentCard	PostalCode	""

Namespace	Property name	Example value
PaymentCard	Country	"<<Default country/region>>"

Response.Properties

Namespace	Property name	Example value
MerchantAccount	ServiceAccountId	"<<GUID>>"
PaymentCard	CardType	"Visa" (**CardType** enum)
PaymentCard	CardToken	"<<Token>>"
PaymentCard	Last4Digits	"1111"
PaymentCard	UniqueCardId	"<<GUID>>"
PaymentCard	ExpirationYear	2015
PaymentCard	ExpirationMonth	11
PaymentCard	StreetAddress	"One Microsoft Way"
PaymentCard	City	"Redmond"
PaymentCard	State	"WA"
PaymentCard	PostalCode	"98052"
PaymentCard	Country	"US"
Connector	ConnectorName	"<<Connector name>>"

Authorization method

The **Authorization()** method is used to authorize the transaction amount with a bank, to put a hold on the required funds. We no longer support the required interaction properties, and the clients will pass **null**.

Request.Properties

Namespace	Property name	Example value
MerchantAccount	*	*
<<Begin options>> **<<Option: manual entry>>**		
PaymentCard	CardType	"Visa" (**CardType** enum)
PaymentCard	CardNumber	"4111111111111111"
PaymentCard	VoiceAuthorizationCode*	"<<Approval code>>"

Namespace	Property name	Example value
PaymentCard	CardVerificationValue	“999”
PaymentCard	ExpirationYear	2015
PaymentCard	ExpirationMonth	11
PaymentCard	StreetAddress	“One Microsoft Way”
PaymentCard	City	“Redmond”
PaymentCard	State	“WA”
PaymentCard	PostalCode	“98052”
PaymentCard	Country	“US”
<<Option: tokenized credit card>>		
PaymentCard	CardType	“Visa” (**CardType** enum)
PaymentCard	CardToken	“<<Token>>“
PaymentCard	Last4Digits	“1111”
PaymentCard	UniqueCardId	“<<GUID>>“
PaymentCard	ExpirationYear	2015
PaymentCard	ExpirationMonth	11
PaymentCard	StreetAddress	“One Microsoft Way”
PaymentCard	City	“Redmond”
PaymentCard	State	“WA”
PaymentCard	PostalCode	“98052”
<<Option: swipe credit card>>		
PaymentCard	CardType	“Visa” (**CardType** enum)
PaymentCard	CardNumber	“4111111111111111”
PaymentCard	Track1*	“<<Track 1>>“
PaymentCard	Track2*	“<<Track 2>>“
<<Option: swipe debit card>>		
PaymentCard	CardType	“Debit” (**CardType** enum)
PaymentCard	CardNumber	“9111111111111111”
PaymentCard	Track2	“<<Track 2>>“

Namespace	Property name	Example value
PaymentCard	CashBackAmount*	<<Cash back amount>
PaymentCard	EncryptedPin	<<Encrypted PIN>>
PaymentCard	AdditionalSecurityData	<<Additional data>>
PaymentCard	AccountType	<<**AccountType** enum>>
<<End options>>		
TransactionData	IsTestMode*	"true"
TransactionData	IndustryType	<<**IndustryType** enum>>
TransactionData	PurchaseLevel	<<**PurchaseLevel** enum>>
TransactionData	AllowPartialAuthorization	"true"
TransactionData	SupportCardTokenization	"true"
TransactionData	Amount	<<Amount>>
TransactionData	CurrencyCode	"USD"
TransactionData	TerminalId*	"<<Terminal ID>>"
PurchaseLevelData	L2Data*	<<PaymentProperty[]>>
PurchaseLevelData	L3Data*	<<PaymentProperty[]>>

* If available and required

Payment properties that are required for Level 2

Namespace	Property name	Example value
L2Data	OrderDateTime	"<<Date/time>>"
L2Data	OrderNumber	"<<Order number>>"
L2Data	InvoiceDateTime	"<<Date/time>>"
L2Data	InvoiceNumber	"<<Invoice number>>"
L2Data	OrderDescription	"<<Order description>>"
L2Data	SummaryCommodityCode	"<<Commodity code>>"
L2Data	MerchantContact	"<<Merchant contact>>"
L2Data	MerchantTaxId	"<<Merchant tax ID>>"
L2Data	MerchantType	"<<Merchant type>>"

Namespace	Property name	Example value
L2Data	PurchaserId	“<<Purchaser ID>>“
L2Data	PurchaserTaxId	“<<Purchaser tax ID>>“
L2Data	ShipToCity	“<<Ship-to city>>“
L2Data	ShipToCounty	“<<Ship-to county>>“
L2Data	ShipToState_ProvinceCode	“<<Ship-to state>>“
L2Data	ShipToPostalCode	“<<Ship-to ZIP/postal code>>“
L2Data	ShipToCountryCode	“<<Ship-to country/region>>“
L2Data	ShipFromCity	“<<Ship-from city>>“
L2Data	ShipFromCounty	“<<Ship-from county>>“
L2Data	ShipFromState_ProvinceCode	“<<Ship-from state>>“
L2Data	ShipFromPostalCode	“<<Ship-from ZIP/postal code>>“
L2Data	ShipFromCountryCode	“<<Ship-from country/region>>“
L2Data	DiscountAmount	<<Discount amount>>
L2Data	MiscCharge	<<Miscellaneous charge>>
L2Data	DutyAmount	<<Duty amount>>
L2Data	FreightAmount	<<Freight amount>>
L2Data	HandlingCharge	<<Handling charge>>
L2Data	IsTaxable	“true”
L2Data	TotalTaxAmount	<<Total tax amount>>
L2Data	TotalTaxRate	<<Total tax rate>>
L2Data	MerchantName	“<<Merchant name>>“
L2Data	MerchantCity	“<<Merchant city>>“
L2Data	MerchantState	“<<Merchant state>>“
L2Data	MerchantCounty	“<<Merchant county>>“
L2Data	MerchantCountryCode	“<<Merchant country/region>>“
L2Data	MerchantZip	“<<Merchant ZIP/postal code>>“
L2Data	TaxRate	<<Tax rate>>
L2Data	TaxAmount	<<Tax amount>>

Namespace	Property name	Example value
L2Data	TaxDescription	“<<Tax description>>“
L2Data	TaxTypeIdentifier	“<<**TaxIdentifierType** enum>>“
L2Data	RequesterName	“<<Requester name>>“
L2Data	TotalAmount	<<Total amount>>
L2Data	PurchaseCardType	“<<**PurchaseCardType** enum>>“
L2Data	AmexLegacyDescription1	“<<Description 1>>“
L2Data	AmexLegacyDescription2	“<<Description 2>>“
L2Data	AmexLegacyDescription3	“<<Description 3>>“
L2Data	AmexLegacyDescription4	“<<Description 4>>“
L2Data	TaxDetails	<<PaymentProperty[]>>
L2Data	MiscellaneousCharges	<<PaymentProperty[]>>

Tax detail properties

TaxDetails

Namespace	Property name	Example value
<<Contains an array of tax details>>		
TaxDetails	TaxDetail	<<PaymentProperty[]>>
<<Contains an array of tax details>>		
TaxDetail	TaxRate	<<Tax rate>>
TaxDetail	TaxDescription	“<<Tax description>>“
TaxDetail	TaxAmount	<<Tax amount>>
TaxDetail	TaxTypeIdentifier	“<<**TaxIdentifierType** enum>>“

Miscellaneous charge properties

MiscellaneousCharges

Namespace	Property name	Example value
<<Contains an array of miscellaneous charges>>		
MiscellaneousCharges	MiscellaneousCharge	<<PaymentProperty[]>>

Namespace	Property name	Example value
<<Contains an array of miscellaneous charges>>		
MiscellaneousCharge	ChargeType	<<Charge type>>
MiscellaneousCharge	ChargeAmount	"<<Charge amount>>"

Payment properties that are required for Level 3

Namespace	Property name	Example value
<<Contains an array of L3DataItems>>		
PurchaseLevelData	L3DataItems	<<PaymentProperty[]>>
<<Contains an array of L3Data>>		
L3Data	SequenceNumber	"<<Sequence number>>"
L3Data	CommodityCode	"<<Commodity code>>"
L3Data	ProductCode	"<<Product code>>"
L3Data	ProductName	"<<Product name>>"
L3Data	ProductSKU	"<<Product SKU>>"
L3Data	Descriptor	"<<Descriptor>>"
L3Data	UnitOfMeasure	"<<Unit of measure>>"
L3Data	UnitPrice	<<Unit price>>
L3Data	Discount	<<Discount>>
L3Data	DiscountRate	<<Discount rate>>
L3Data	Quantity	<<Quantity>>
L3Data	MiscCharge	<<Miscellaneous charge>>
L3Data	NetTotal	<<Net total>>
L3Data	TaxAmount	<<Tax amount>>
L3Data	TaxRate	<<Tax rate>>
L3Data	TotalAmount	<<Total amount>>
L3Data	CostCenter	"<<Cost center>>"
L3Data	FreightAmount	<<Freight amount>>
L3Data	HandlingAmount	<<Handling amount>>

Namespace	Property name	Example value
L3Data	CarrierTrackingNumber	"<<Tracking number>>"
L3Data	MerchantTaxID	"<<Merchant tax ID>>"
L3Data	MerchantCatalogNumber	"<<Catalog number>>"
L3Data	TaxCategoryApplied	"<<Category applied>>"
L3Data	PickupAddress	"<<Pickup address>>"
L3Data	PickupCity	"<<Pickup city>>"
L3Data	PickupState	"<<Pickup state>>"
L3Data	PickupCounty	"<<Pickup county>>"
L3Data	PickupZip	"<<Pickup ZIP/postal code>>"
L3Data	PickupCountry	"<<Pickup country/region>>"
L3Data	PickupDateTime	"<<Pickup date/time>>"
L3Data	PickupRecordNumber	"<<Record number>>"
L3Data	CarrierShipmentNumber	"<<Shipment number>>"
L3Data	UNSPSCCode	"<<UNSPSC code>>"
L3Data	TaxDetails	<<PaymentProperty[]>>
L3Data	MiscellaneousCharges	<<PaymentProperty[]>>

Level 3 also requires tax detail properties and miscellaneous charge properties on each line.

Here are the response properties from the payment connector that the client uses.

Response.Properties

Namespace	Property name	Example value
MerchantAccount	ServiceAccountId	<<GUID>>
AuthorizationResponse	Properties	<<PaymentProperty[]>>
Connector	ConnectorName	"<<Connector name>>"
<<Authorization response properties>>		
AuthorizationResponse	AuthorizationResult	"<<**AuthorizationResult** enum>>" (for example, **"Success"** or **"PartialAuthorization"**)
AuthorizationResponse	ApprovedAmount	<<Approved amount>>

Namespace	Property name	Example value
AuthorizationResponse	CashBackAmount	<<Cash back amount>>
AuthorizationResponse	AvailableBalance	<<Balance>>
AuthorizationResponse	UniqueCardId*	"<<Unique card ID>>"
AuthorizationResponse	Last4Digits	"<<Last four digits>>"
AuthorizationResponse	CardType	"<<**CardType** enum>>"
AuthorizationResponse	ApprovalCode	"<<Approval code>>"
AuthorizationResponse	ProviderTransactionId	"<<Provider transaction ID>>"
AuthorizationResponse	AVSResult	"<<**AVSResult** enum>>"
AuthorizationResponse	AVSDetail	"<<**AVSDetail** enum>>"
AuthorizationResponse	CVV2Result	"<<**CVV2Result** enum>>"
AuthorizationResponse	TransactionType	"<<**TransactionType** enum>>"

* Returned only if a token was sent in the request

Capture method

The **Capture()** method is used to settle the authorization transaction and move the funds at the bank.

Request.Properties

Namespace	Property name	Example value
MerchantAccount	*	*
PaymentCard	CardNumber*	"4111111111111111"
TransactionData	Amount	<<Amount>>
TransactionData	CurrencyCode	"USD"
TransactionData	IsTestMode*	"true"
TransactionData	SupportCardTokenization	"true"
TransactionData	PurchaseLevel	<<**PurchaseLevel** enum>>
AuthorizationResponse	Properties	<<PaymentProperty[]>>
PurchaseLevelData	L2Data*	<<PaymentProperty[]>>
PurchaseLevelData	L3Data*	<<PaymentProperty[]>>

* If available and required

Here are the response properties from the payment connector that the client uses.

Response.Properties

Namespace	Property name	Example value
MerchantAccount	ServiceAccountId	<<GUID>>
CaptureResponse	Properties	<<PaymentProperty[]>>
Connector	ConnectorName	"<<Connector name>>"
<<Capture response properties>>		
CaptureResponse	CaptureResult	"<<**CaptureResult** enum>>" (for example, **"Success"**)
CaptureResponse	UniqueCardId*	"<<Unique card ID>>"
CaptureResponse	Last4Digits	"<<Last four digits>>"
CaptureResponse	CardType	"<<**CardType** enum>>"
CaptureResponse	TransactionType	"<<**TransactionType** enum>>"

* Returned only if a token was sent in the request

Void method

The **Void()** method is used to void/reverse the authorization transaction and unlock the funds at the bank.

Request.Properties

Namespace	Property name	Example value
MerchantAccount	*	*
PaymentCard	CardNumber*	"4111111111111111"
TransactionData	Amount	<<Amount>>
TransactionData	CurrencyCode	"USD"
TransactionData	IsTestMode*	"true"
TransactionData	SupportCardTokenization	"true"
AuthorizationResponse	Properties	<<PaymentProperty[]>>

* If available and required

Here are the response properties from the payment connector that the client uses.

Response.Properties

Namespace	Property name	Example value
MerchantAccount	ServiceAccountId	<<GUID>>
VoidResponse	Properties	<<PaymentProperty[]>>
Connector	ConnectorName	"<<Connector name>>"
<<Void response properties>>		
VoidResponse	VoidResult	"<<**VoidResult** enum>>" (for example, **"Success"**)

* Returned only if a token was sent in the request

Refund method

The **Refund()** method is used to refund a payment transaction and return funds to the customer's bank. This method has the same request as the **Authorization()** method. The only difference is that sometime a linked refund is required when the **Capture** response is also part of the request message. We no longer support the required interaction properties, and the clients will pass **null**.

Here are the response properties from the payment connector that the client uses.

Response.Properties

Namespace	Property name	Example value
MerchantAccount	ServiceAccountId	<<GUID>>
RefundResponse	Properties	<<PaymentProperty[]>>
Connector	ConnectorName	"<<Connector name>>"
<<Refund response properties>>		
RefundResponse	RefundResult	"<<**RefundResult** enum>>" (for example, **"Success"**)
RefundResponse	ApprovalCode	"<<Approval code>>"
RefundResponse	UniqueCardId*	"<<Unique card ID>>"
RefundResponse	Last4Digits	"<<Last four digits>>"
RefundResponse	CardType	"<<**CardType** enum>>"
RefundResponse	TransactionType	"<<**TransactionType** enum>>"

* Returned only if a token was sent in the request

GetPaymentAcceptPoint method

The **GetPaymentAcceptPoint()** method and the next method, **RetrievePaymentAcceptResult()**, form a pair. Together, they enable the client to make a payment by using the payment accepting page. We will discuss the payment accepting web app in detail in part 2 of this document.

The **GetPaymentAcceptPoint()** method is used to get the URL of the payment accepting page. The caller provides the merchant credentials, the default card data, and the transaction data in the request. The method returns the response that contains the URL that points to the payment page.

Request.Properties

Namespace	**Property name**	**Example value**
MerchantAccount	*	*
PaymentCard	CardType	"Visa,MasterCard,Amex,Discover" (**CardType** enum)
PaymentCard	Name	"John Doe"
PaymentCard	StreetAddress	"One Microsoft Way"
PaymentCard	City	"Redmond"
PaymentCard	State	"WA"
PaymentCard	PostalCode	"98052"
PaymentCard	Country	"US"
PaymentCard	ShowSameAsShippingAddress	"true", "false"
TransactionData	TransactionType	"<<**TransactionType** enum>>" (for example, **"None"**, **"Authorize"**, or **"Capture"**)
TransactionData	SupportCardSwipe	"true", "false"
TransactionData	SupportCardTokenization	"true", "false"
TransactionData	HostPageOrigin	"https://www.contoso.com"
TransactionData	PaymentAcceptAdaptorPath	"https://www.contoso.com/connector"
TransactionData	HideBillingAddress	"true", "false"
<<Authorization properties>>		
TransactionData	IsTestMode*	"true", "false"
TransactionData	IndustryType	<<**IndustryType** enum>>
TransactionData	PurchaseLevel	<<**PurchaseLevel** enum>>

Namespace	Property name	Example value
TransactionData	AllowPartialAuthorization	"true", "false"
TransactionData	AllowVoiceAuthorization	"true", "false"
TransactionData	CurrencyCode	"USD"
TransactionData	TerminalId*	"<<Terminal ID>>"

* If available and required

Billing address properties, such as **StreetAddress** and **City**, are optional. They contain the default values of the payment card that will appear on the payment accepting page. The user can accept the default values or provide new values.

The **ShowSameAsShippingAddress** property contains a Boolean value that indicates whether the payment accepting page should show the **Same as shipping address** option.

The **TransactionType** property in the request contains a value from the **TransactonType** enum. However, in this method, the value can be only "**None**", **"Authorize"**, or **"Capture"**. For more information, see part 2 of this document.

The **HostPageOrigin** property represents the page that will host (embed) the payment accepting page. Its value contains the protocol, domain, and port of the host page URL.

The **PaymentAcceptAdaptorPath** property is optional. When the payment accepting page doesn't support cross-domain messaging, a few adaptor files (HTML, CSS, JavaScript) must be dropped into the host page server. This property contains the server path where those adaptor files are dropped.

New in 10.0.5. The **HideBillingAddress** optional property can be used to skip billing address entry in the payment accepting page. When this is enabled, the e-commerce website must implement the billing address acceptance flow outside of the payment iFrame and include the billing address when sending the checkout request.

The authorization properties in the request are required only when the **TransactionType** property is set to **"Authorize"** or **"Capture"**.

Response.Properties

Namespace	Property name	Example value
MerchantAccount	ServiceAccountId	<<GUID>>
Connector	ConnectorName	"<<Connector name>>"
TransactionData	PaymentAcceptUrl	"https://www.paymentaccept.com/CardPage.aspx?tqi=2EC80BD0-8FEF-4ACC-BB4B-D460337A7F6A"
TransactionData	PaymentAcceptMessageOrigin	"https://www.paymentaccept.com/CardPage.aspx"

Namespace	Property name	Example value
TransactionData	PaymentAcceptSubmitUrl	"https://www.paymentaccept.com/CardPage.aspx?tqi=2EC80BD0-8FEF-4ACC-BB4B-D460337A7F6A#submit"

The **PaymentAcceptUrl** property contains the URL that points to the payment accepting page. The client will open the page for submitting a payment.

The **PaymentAcceptMessageOrigin** property contains the origin of the page that communicates with the host page by using cross-domain messaging. Usually, this page is the same page that is specified by **PaymentAcceptUrl**. In this case, **PaymentAcceptMessageOrigin** contains the first part of the **PaymentAcceptUrl** value. However, the page can also be a different page that has a different origin.

Note: The page origin is the beginning of a page URL, and includes the protocol, double slashes, and domain.

The **PaymentAcceptSubmitUrl** property is optional. When cross-domain messaging isn't supported, this property provides another way to trigger the payment accepting page to submit the payment.

RetrievePaymentAcceptResult method

After the payment is submitted from the payment accepting page, the client receives a result access code. The **RetrievePaymentAcceptResult()** method is used to retrieve the payment accepting result by using the access code.

Depending on the transaction type, the payment accepting result might contain a card token, an authorization response, a capture response, or all three.

Request.Properties

Namespace	Property name	Example value
MerchantAccount	*	*
TransactionData	PaymentAcceptResultAccessCode	"<<GUID>>" or any string
TransactionData	TerminalId*	"<<Terminal ID>>"

* If available and required

Response.Properties

Namespace	Property name	Example value
MerchantAccount	ServiceAccountId	<<GUID>>
Connector	ConnectorName	"<<Connector name>>"
PaymentCard	CardType	"Visa" (**CardType** enum)
PaymentCard	CardToken	"<<Token>>"
PaymentCard	Last4Digits	"1111"

Namespace	Property name	Example value
PaymentCard	UniqueCardId	"<<GUID>>"
PaymentCard	ExpirationYear	2015
PaymentCard	ExpirationMonth	11
PaymentCard	Name	"John Doe"
PaymentCard	StreetAddress	"One Microsoft Way"
PaymentCard	City	"Redmond"
PaymentCard	State	"WA"
PaymentCard	PostalCode	"98052"
PaymentCard	Country	"US"
AuthorizationResponse	Properties	<<PaymentProperty[]>>
CaptureResponse	Properties	<<PaymentProperty[]>>
VoidResponse	Properties	<<PaymentProperty[]>>

For the properties inside **AuthorizationResponse**, see the Authorization method section.

For the properties inside **CaptureResponse**, see the Capture method section.

For the properties inside **VoidResponse**, see the Void method section.

Unsupported methods

The following methods are no longer called or aren't currently supported by the clients:

- **ImmediateCapture()** – This functionality is now internally handled by the payment connector. Some payment gateways support only a single call for authorization and capture, instead of a call for authorization only and then a call for capture only. Basically, the connector sets the **TransactionType** property to **ImmediateCapture** and implements "No Operation" in the capture call.
- **Reversal()**
- **Reauthorize()**
- **ActivateGiftCard()**
- **LoadGiftCard()**
- **BalanceOnGiftCard()**

Enumeration types

Some of the payment properties that were listed earlier have predefined string values. The payment SDK provides the enumeration types for their possible values. For example, when the payment card is American Express, the value of the **CardType** property should be **"Amex"**, not **"American Express"** or **"AmericanExpress"**.

It's very important that you use these enum values, so that the payment connector and its caller can understand each other.

If you require a new value for one of the payment properties, such as a new **EBT** card type, you can set the property value directly (for example, as **"EBT"**). You don't have to add a new enum value to the enum type (in fact, you can't). After all, those payment properties just require a string value. You can set any value that you want, provided that the payment connector understands and can handle the new value.

Enumeration type	**Enumeration values**
AccountType	Checking, Deposit
AuthorizationResult	None, Success, Failure, Referral, PartialAuthorization, ImmediateCaptureFailed
AVSDetail	None, AccountholderName, BillingAddress, BillingPostalCode, BillingAndPostalCode
AVSResult	None, Returned, NotReturned, VerificationNotSupported, SystemUnavailable
CaptureResult	None, Success, Failure
CardType	Unknown, Debit, Visa, MasterCard, Discover, Amex
CVV2Result	Unknown, Success, Failure, IssuerNotRegistered, NotProcessed
IndustryType	Retail, DirectMarketing, Ecommerce
PurchaseCardType	U (Unknown), P (Purchase Card), C (Corporate Card), B (Business Card)
PurchaseLevel	Level1, Level2, Level3
RefundResult	None, Success, Failure
TaxIdentifierType	AlternateTax, NationalTax, LocalTax, VATTax
TransactionType	None, Authorize, Reauthorize, Capture, ImmediateCapture, Void, Reversal, Refund
VoidResult	None, Success, Failure

Part 2: Implementing a payment accepting web app

This part of the document explains how to create a web application to tokenize a credit card or process a card payment in a secure manner.

The roles

Accepting a payment mainly involves three roles:

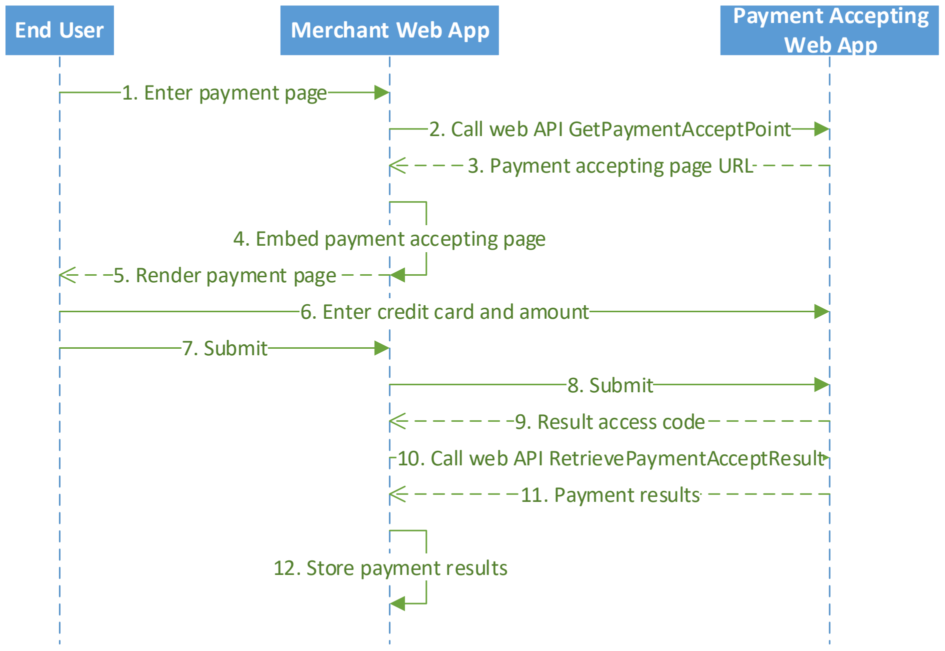
- **End user** – The person who uses a retail application to enter credit card information. This person can be a consumer who uses the online storefront to buy a product or a sales representative at the call center who uses an internal enterprise resource planning (ERP) system to help a consumer buy a product.

- **Merchant application** – The retail web application that is hosted by a merchant or its vendor. This application can be the online storefront or the internal ERP system. The end user mainly interacts with the merchant application to complete a sales transaction.
- **Payment accepting application** – The front-end web application that is hosted by a payment provider. This application provides payment accepting functionality to the merchant application behind the scenes. The payment accepting application is integrated into the merchant application to serve the end user.

Note: We can't use the merchant application directly to tokenize a credit card, because we don't want the primary account number (PAN) of the credit card to enter the merchant application. Therefore, we must have a separate payment accepting application to take the credit card number and process the payment. For more information about how the payment accepting application works, see the next section.

The scenario

The following sequence diagram shows the steps of accepting a payment.


End User
Merchant Web App
Payment Accepting Web App
1. Enter payment page
2. Call web API GetPaymentAcceptPoint
3. Payment accepting page URL
4. Embed payment accepting page
5. Render payment page
6. Enter credit card and amount
7. Submit
8. Submit
9. Result access code
10. Call web API RetrievePaymentAcceptResult
11. Payment results
12. Store payment results

1 The end user is using the merchant application (for example, he or she creates a shopping cart) and is ready to enter the payment.
2 The merchant application calls a web service API (**GetPaymentAcceptPoint**, via the payment connector) to retrieve the unique URL of the payment accepting page. During the call, the merchant application provides the merchant credentials to the payment accepting application for authentication.
3 The payment accepting application authenticates the merchant credentials, and generates and returns the URL of the payment accepting page together with a unique ID for each transaction.
4 The merchant application embeds the payment accepting page into the payment host page.
5 The content of both pages is rendered in the end user's browser.
6 The end user enters his or her credit card information on the payment accepting page.
7 The end user clicks **Submit** on the payment host page.

8 The **Submit** button on the payment host page triggers the posting of the payment accepting page.
9 The payment accepting application takes the credit card information, together with the information that was received in step 2, processes the payment, generates a unique result access code, and sends the result access code to the merchant application.
10 The merchant application calls a second web service API (**RetrievePaymentAcceptResult**) and provides the result access code.
11 The payment accepting application validates the result access code and, in exchange, returns the payment results.
12 The merchant application stores the payment results as a record or for later use.

Note: In step 9, the result access code technically isn't sent directly from the payment accepting application to the merchant application. Instead, it's sent via cross-domain messaging in the user's browser. For more information, see the Cross-domain messaging section.

How to build and run the sample projects

To demonstrate how the scenario can be implemented, we built two sample projects as part of the sample code solution.

When you download the sample code and open the solution in Microsoft Visual Studio, you will find the following projects:

- **PaymentSdk.Connector.Sample** – This project contains the portable version of Sample Connector.
- **PaymentSdk.Connector.Sample.Desktop** – This project contains the non-portable version of Sample Connector. It references the portable version to reuse its business logic.
- **PaymentSdk.Connector.Sample.PaymentAcceptWeb** – This project is a sample implementation of the payment accepting application. The payment connector developer must follow the sample, and must create his or her own application.
- **PaymentSdk.Connector.Sample.MerchantWeb** – This project is a sample implementation of the merchant application. The sample contains only the minimal code to demonstrate how MerchantWeb interacts with PaymentAcceptWeb. It doesn't contain other parts of the merchant application. The payment connector developer does **not** have to implement the merchant application.
- **PaymentSdk.Connector.FunctionalTests** – This project contains the automated tests for Sample Connector.

Here are the steps to build and run the sample projects.

1 In Visual Studio, under the **App_Data** folder, expand the **PaymentAcceptWeb** project, and run the following SQL files one at a time to create a database that is named **CardPaymentAccept**:
   - Tables.sql creates a database and configures the database to encrypt all its tables. You must update the encryption password before you run this file.
   - Sprocs/*.sql contains all the stored procedures.
   - Seed/Seed.sql creates the country/region data. You must update the data file path before you run this file.
   - Jobs.sql creates a SQL job to purge history data.

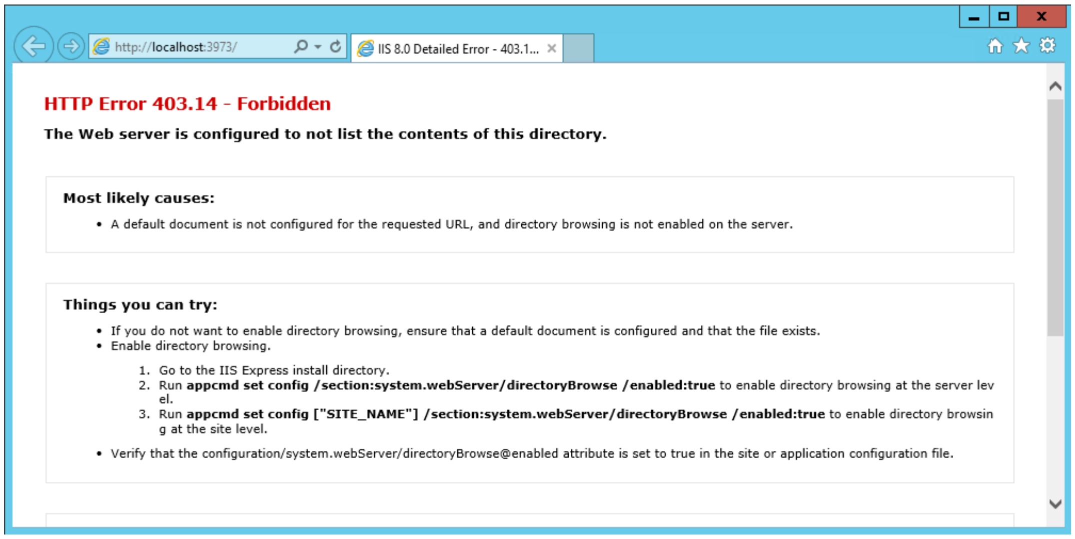
2 Open the web.config file of both PaymentAcceptWeb and MerchantWeb, find the **compilation** node, and change the **debug** attribute to **true**.
3 Right-click the solution, and then click **Build Solution**.

4 Right-click the solution, and then click **Properties**. Under **Start Project**, select **Multiple startup projects**, and then set both **PaymentAcceptWeb** and **MerchantWeb** to **Start**. Click **OK**.

5 Click **Start** to open both projects in Internet Information Services (IIS) Express.

Two browser windows should be opened:

- One window opens http://localhost:3973/, which is the URL of PaymentAcceptWeb. Expect an HTTP error because, by design, a default page isn't specified for PaymentAcceptWeb.



HTTP Error 403.14 - Forbidden

The Web server is configured to not list the contents of this directory.

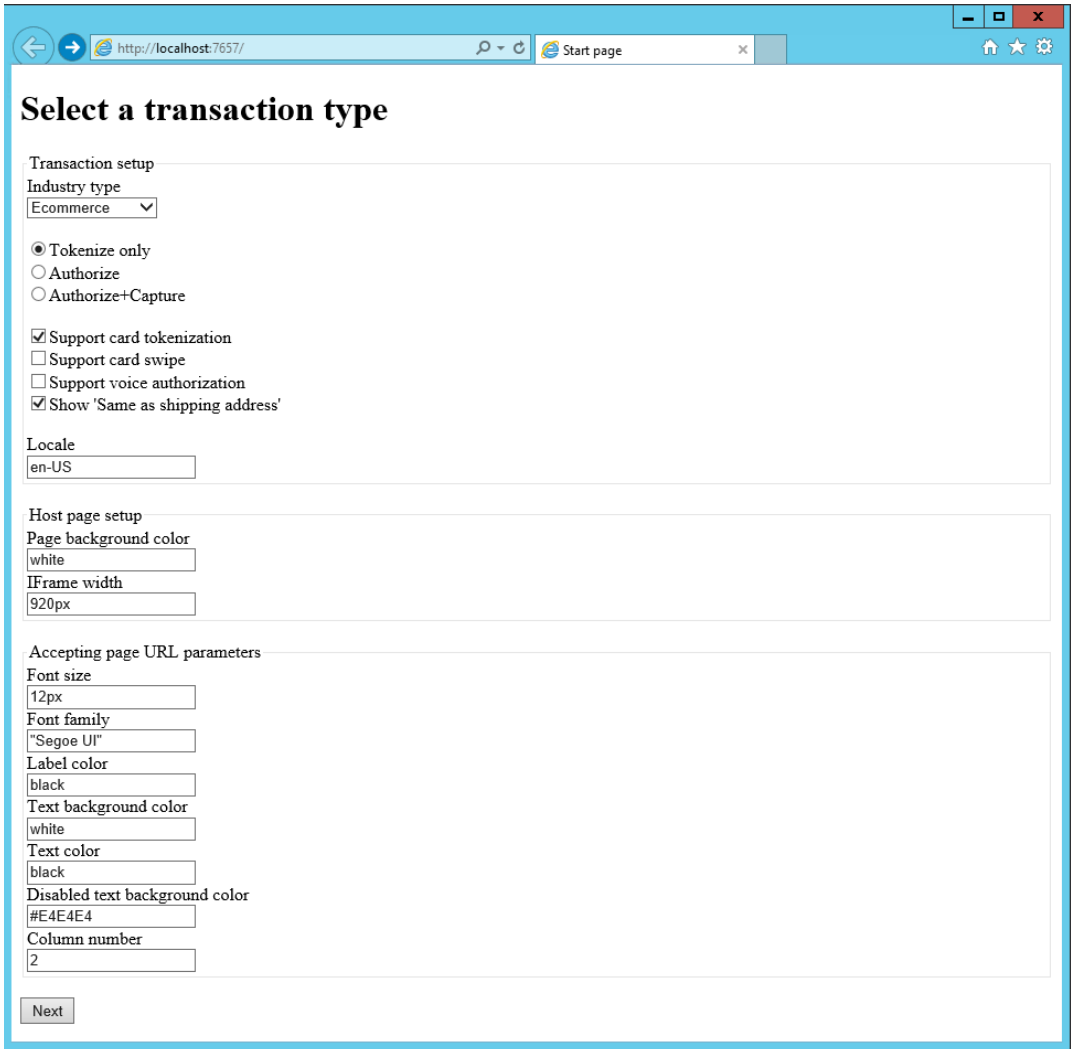
Most likely causes:

- A default document is not configured for the requested URL, and directory browsing is not enabled on the server.

Things you can try:

- If you do not want to enable directory browsing, ensure that a default document is configured and that the file exists.
- Enable directory browsing.
  1. Go to the IIS Express install directory.
  2. Run **appcmd set config /section:system.webServer/directoryBrowse /enabled:true** to enable directory browsing at the server lev el.
  3. Run **appcmd set config ["SITE_NAME"] /section:system.webServer/directoryBrowse /enabled:true** to enable directory browsin g at the site level.
- Verify that the configuration/system.webServer/directoryBrowse@enabled attribute is set to true in the site or application configuration file.

- The other window opens http://localhost:7657/, which is the URL of MerchantWeb. The page should resemble the following screen shot.



Select a transaction type

Transaction setup

Industry type: Ecommerce

- (●) Tokenize only
- ( ) Authorize
- ( ) Authorize+Capture

- ☑ Support card tokenization
- ☐ Support card swipe
- ☐ Support voice authorization
- ☑ Show 'Same as shipping address'

Locale: en-US

Host page setup

Page background color: white

IFrame width: 920px

Accepting page URL parameters

Font size: 12px

Font family: "Segoe UI"

Label color: black

Text background color: white

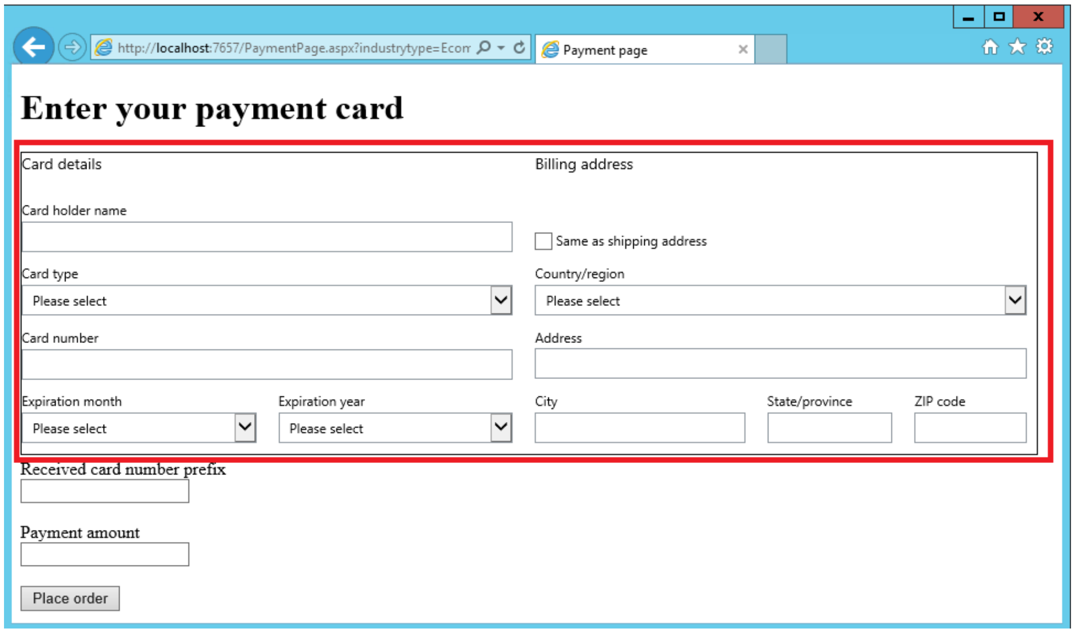
Text color: black

Disabled text background color: #E4E4E4

Column number: 2

6 You can specify the industry type, the transaction type, and other options. Then click **Next**.

7 The next page simulates the payment page of the merchant application, where the consumer enters his or her credit card information and the amount. It's very important to understand that this page contains a parent page and a child page. The parent page (payment host page) is provided by the merchant application and is the content outside the red rectangle in the following screen shot. The child page (payment accepting page) is provided by the payment accepting application is the content inside the red rectangle. The child page is embedded in the parent page as an inline frame (iframe).



Enter your payment card

Card details

Card holder name

Card type: Please select

Card number

Expiration month: Please select

Expiration year: Please select

Billing address

☐ Same as shipping address

Country/region: Please select

Address

City

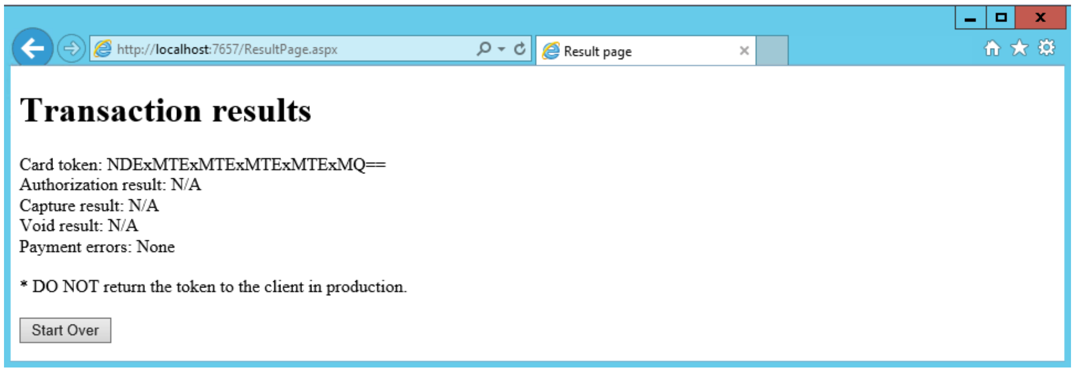
State/province

ZIP code

Received card number prefix

Payment amount

8 You can enter some test credit card information, an amount, and then click **Place order**. You will see a result page that resembles the following screen shot.



Transaction results

Card token: NDExMTExMTExMTExMTExMQ==
Authorization result: N/A
Capture result: N/A
Void result: N/A
Payment errors: None

* DO NOT return the token to the client in production.

Requirements of a payment accepting application

In the previous section, we looked at a sample implementation of the payment accepting application. However, there are other ways to implement this type of application. It's important to distinguish the feature requirements from the implementation choices. As a payment connector developer, you must satisfy the feature requirements to guarantee a smooth integration. However, for your implementation, you can make choices that differ from choices that were made for the sample implementation.

Requirement 1

The payment connector must implement the **GetPaymentAcceptPoint** API. This API is part of the **IPaymentProcessor** interface. It retrieves the URL of the payment accepting page from the payment provider.

When the merchant application is ready to take a credit card, it calls **GetPaymentAcceptPoint** on the payment connector, and uses input such as the merchant credentials, default information for the card (for example, the default billing address), and transaction data (for authorization and/or capture). The payment connector passes the information to the payment accepting application by calling the corresponding web service.

The payment accepting application must first validate the merchant credentials. The request information is then temporarily stored as a payment entry for later use. Next, the payment accepting application generates the URL of the payment accepting page. The URL must contain a single-use request ID that is linked to the previous payment entry. This URL is returned to the caller.

Requirement 2

The payment provider must host a payment accepting page on its server (CardPage.aspx in PaymentAcceptWeb). The URL that was retrieved earlier will be used to open this page.

The payment accepting page must contain all the credit card fields that are required for the industry type and the transaction type. The following table shows which fields are required for each industry.

Field	Retail	Direct marketing	E-Commerce
Card input (for example, **Swipe card**, **Enter manually**, and **Voice authorization**)	Yes, when more than one option is available	No	No
Card holder name	No	Yes	Yes
Card type	No	Yes	Yes
Card number	Yes	Yes	Yes
Expiration month and year	Yes	Yes	Yes
Security code	Yes, when **TransactionType** isn't set to **None**	Yes, when **TransactionType** isn't set to **None**	Yes, when **TransactionType** isn't set to **None**
Voice authorization code	Yes, when **AllowVoiceAuthorization** is set to **true**	Yes, when **AllowVoiceAuthorization** is set to **true**	No
Same as shipping address	Yes, when **ShowSameAsShippingAddress** is set to **true**	Yes, when **ShowSameAsShippingAddress** is set to **true**	Yes, when **ShowSameAsShippingAddress** is set to **true**
Country/region	No	Yes	Yes

Field	Retail	Direct marketing	E-Commerce
Address	No	Yes	Yes
City	No	Yes	Yes
State/province	No	Yes	Yes
ZIP code	Yes (in the first column)	Yes (in the second column)	Yes (in the second column)
1 column or 2	Only **1**	**1** or **2**	**1** or **2**

Note: For the retail industry, the payment accepting page has only one column and only a few fields, to help achieve faster payment processing.

The payment accepting page must support three transaction types:

- **Tokenization** – When **TransactionType** is set to **None** and **SupportCardTokenization** is set to **true**, the page only tokenizes the card.
- **Authorization** – When **TransactionType** is set to **Authorize**, the page authorizes the payment but doesn't capture it. The authorization might also return a card token, depending on the value of the **SupportCardTokenization** property.
- **Authorization and Capture** – When **TransactionType** is set to **Capture**, the page authorizes the payment and then captures it. If authorization succeeds but capture fails, the page must void the authorization before it returns the error.

The payment accepting page must meet all the following conditions:

- It must find the payment entry, based on the request ID, and enter the default values.
- It must display texts in the desired language, based on the request locale.
- It must follow the look and feel that are provided in the sample project.
- It must validate the card information before it tokenizes the card and/or processes the payment.
- It must generate a result access code after payment is processed and must send this access code to the parent page (the payment host page). The result access code must be a unique string to retrieve the payment results.
- It must use secure cross-domain messaging to communicate with the parent page (the payment host page) – for example, by sending a result access code to the parent page. For more information about cross-domain messaging, see the Cross-domain messaging section.

Requirement 3

The payment connector must implement the **RetrievePaymentAcceptResult** API. This API is also part of the **IPaymentProcessor** interface. It exchanges the token access code for the real card token.

After the merchant application receives a result access code, it calls **RetrievePaymentAcceptResult** and sends the merchant credentials and the result access code. In exchange, it receives the real payment results.

The API must validate the merchant credentials.

If the payment contains **SupportCardTokenization** = **true**, the API must return a response that contains the following information:

- Card token
- Masked card number (for example, the last four digits)
- Card holder name
- Card type
- Expiration month and year
- Card billing address, if the consumer provided this information

The API must **never** return the following information:

- Card number
- Card track data
- Security code (card verification value [CVV])

If the payment contains **TransactionType** = **Authorize** or **Capture**, the API must return a response that contains authorization response properties.

If the payment contains **TransactionType** = **Capture**, the API must return a response that contains capture response properties. If capture fails, the response must also contain void response properties.

The implementation of **RetrievePaymentAccessResult** can vary, depending on the way that payment results are stored and the result access code is generated:

- The result access code can be a formatted string that contains the card token and payment information. In this case, **RetrievePaymentAccessResult** just parses the string and returns the information as a response.
- The result access code can contain the card token and payment information, but can also include encryption. In this case, **RetrievePaymentAccessResult** first decrypts the string. It then parses the string and returns the information.
- **(Recommended)** The result access code can be just a unique code that is linked to a payment. Only the payment provider can convert the access code to the real payment result. In this case, **RetrievePaymentAccessResult** internally maps the result access code to the payment result. The sample implementation used this approach.

Cross-domain messaging

In previous sections, we have briefly mentioned that cross-domain message can be used for communication between the payment host page and the payment accepting page. In this section, we will explore the details.

The payment host page and the payment accepting page are two webpages from two different applications that are hosted in two different domains. To make these two pages work together, we must define “a contract” between them.

The messaging between the two pages is bidirectional.

The payment accepting page (the child page) tells the payment host page (the parent page) five things:

- The height of the child page
- The first six digits of the card number

- The approved amount for partial authorization
- Any input error on the child page
- The result access code

The payment host page (parent) tells the tokenization page (child) four things:

- The card swipe data that contains the track data
- A value that indicates whether the user accepts the partial authorization
- The payment amount (required only when the transaction type is **Authorize** or **Capture**)
- When to submit the payment (for example, when the consumer clicks the **Place order** button on the payment host page)

Cross-domain messaging is achieved through JavaScript. The receiving page adds a message listener by adding some code that resembles this.

```
window.addEventListener("message", receiveMessage);
```

In this code, **receiveMessage** is a JavaScript function that you create to handle the received message. Before you handle the message, it's very important that you validate the origin of the message.

The sending page sends a message by adding some code that resembles this.

```
window.postMessage(message, targetOrigin);
```

In this code, **message** is the string that you want to send, and **targetOrigin** is the URL of the receiving page (for example, https://example.com). It's very important that you specify **targetOrigin**, so that only the expected receiving page will catch this message.

For a detailed example that shows how to use these APIs to securely send messages, see the sample projects.

Finally, we predefined the format of the messages, so that both parties understand each other. Each message is a serialized JavaScript Object Notation (JSON) object that uses **JSON.stringify()**, and that contains a type (**string**) and a value (**string** or **object**).

The following table describes when to use each message and provides example values for each.

When to use	Message direction	Example
When the child page is loaded, it sends the parent page a messages about its page height. The parent page then adjusts the height of the iframe accordingly. If the height of the page changes, the message is sent again. For example, if the value of the **Card input** field is changed from **Enter manually** to **Voice authorization**, the **Voice authorization code** field appears, and therefore the page height increases.	Child to parent	{"type":"**msax-cc-height**","value":262} **Note:** The **msax-cc-width** message type is obsolete. The parent page determines the iframe width. The child page then takes 100 percent of that width up to a maximum width limit.
When the card number is entered, the child page sends a message about the prefix of the card number (the first six digits). Sometimes, the parent page requires this information for payment validation.	Child to parent	{"type":"**msax-cc-cardprefix**","value":"411111"} **Note:** The **msax-cc-cardtype** message type is obsolete.
When the parent page catches a card swipe event, it sends the child page a message about the swipe data. The child page then parses the swipe data, and enters the card type, card number, and expiration month and year. **Note:** Never pass the swipe data from the child page to the parent page.	Parent to child	{"type":"**msax-cc-swipe**","value":"%B4111111111111111^DOE/JOHN^2512^0123456789?;4111111111111111=2512=0123456789?"}
When the authorization amount is only partially approved, before the capture or payment result is sent to the parent page, the child page sends the parent page a message about the partially approved amount. This message asks the user for confirmation.	Child to parent	{"type":"**msax-cc-partialamount**","value":"20.00"} **Note:** This value is used when, for example, the authorization request is for 100.00, but only 20.00 is approved.

When to use	**Message direction**	**Example**
When the parent page receives the preceding message, it asks the user whether he or she accepts the approved amount (**YES** or **NO**). After the user makes a choice, the parent page sends the child page a message about the user's choice.	Parent to child	{"type":"**msax-cc-partialok**","value":"true"} **Note:** If the value is **true**, partial authorization is accepted and processing continues. If the value is **false**, partial authorization is rejected, the authorization is voided, and the result is returned.
When the parent page is ready for the child page to submit itself, it sends the child page two messages about the payment amount and the submit action. The child page records the amount and then submits itself to start the payment process.	Parent to child	{"type":"**msax-cc-amount**","value":"10.00"} {"type":"**msax-cc-submit**","value":"true"}
If the child page finds any input errors, it sends the parent page a message about the errors. The parent page then displays the error messages.	Child to parent	{"type":"**msax-cc-error**","value":[{"Code":22061, "Message":"Card type is missing. "},{"Code":22058, "Message":"Card number is missing. "}]}
When the child page has a result access code ready, it sends the parent page a message. The parent page then uses the result access code to retrieve the payment results.	Child to parent	{"type":"**msax-cc-result**","value":"87c3109e-73f9-28e6-ba64-82010d96827f"}

The sample implementation

Now it's time to look at the sample code and see how it implements the requirements. We will focus on the PaymentAcceptWeb project, because this is the project that the payment provider or its partner must implement.

Main components

The PaymentAcceptWeb project is implemented by using ASP.NET. However, you can choose any web technology. The sample demonstrates the four components that your implementation should have:

- **A CardPaymentAccept database** – This database stores the payment entries and the payment results. You can find the scheme of the sample database in the App_Data folder.
- **A payment accepting page** – This webpage is the only visible UI of the payment accepting application. It contains the fields for entering credit card information. You can find the page as CardPage.aspx.
- **A GetPaymentAcceptPoint web API** – The payment connector calls this web API in the **IPaymentProcessor.GetPaymentAcceptPoint()** method. Because this web API is only used internally by the payment connector, the developer can choose the signature for it. The web API implements the business logic

that is described in the Requirement 1 section. You can find the web API in the Controllers folder, in the **PaymentsController** class.

- **A RetrievePaymentAcceptResult web API** – The payment connector calls this web API in the **IPaymentProcessor.RetrievePaymentAcceptResult()** method. Because this web API is only used internally by the payment connector, the developer can choose the signature for it. The web API implements the business logic that is described in the Requirement 3 section. When the result access code contains the payment results directly, this web API isn't required. However, it's still recommended. You can also find the web API in the Controllers folder, in the **PaymentsController** class.

Styling

The payment accepting page must not have any margin or any padding. In this way, the page can be embedded and positioned at the exact location where it must appear.

The default look and feel of the payment accepting page are defined by a Cascading Style Sheets (CSS) file at CSS > CardPage.css. The style sheet follows the look and feel of the E-Commerce storefront of Microsoft Dynamics AX for Retail.

However, we have also enabled custom styling on the payment accepting page. The following table describes the custom styles that are supported. Because all these style have default values, they are optional. The merchant application can provide new values for some or all of the styles by adding extra query parameters to the URL of the payment accepting page.

Style type and query parameter name	**Purpose**	**Default value**	**Examples of possible values**
FontSize	The font size of text, and also the size of controls and margins	12px	
FontFamily	The font family of all text	"Segoe UI"	"Segoe UI", Georgia **Note:** Use quotation marks when the name of the font family has more than one word. You can specify a list of font families that are separated by commas.
LabelColor	The text color of labels	black	#000000 rgb(0,0,0)

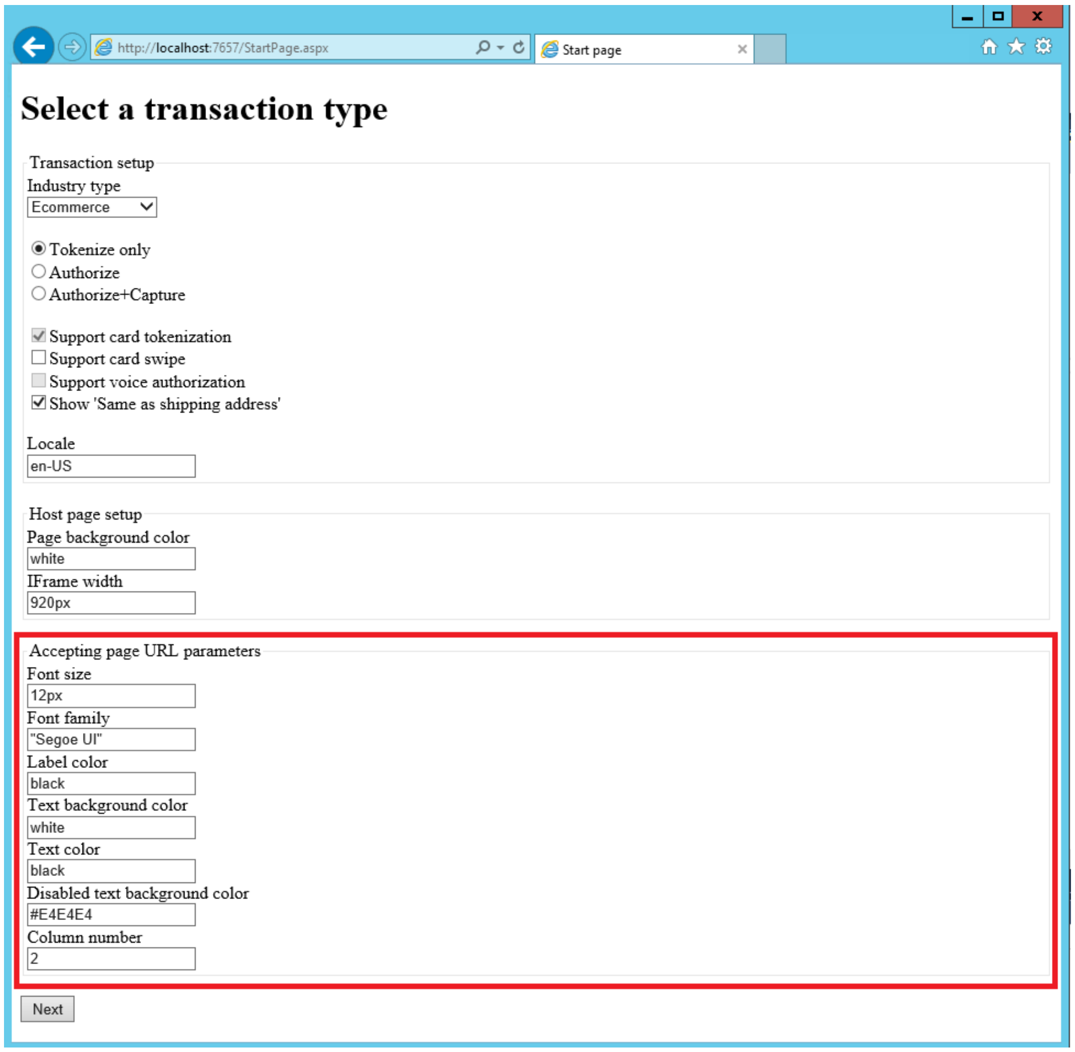
TextBackgroundColor	The background color of text boxes that are available	white	#FFFFFF
			rgb(255,255,255)

Style type and query parameter name	Purpose	Default value	Examples of possible values
TextColor	The text color of text boxes	black	#000000 rgb(0,0,0)
DisabledTextBackgroundColor	The background color of text boxes that aren't available	#E4E4E4	lightgray rgb(228,228,228)
ColumnNumber	The number of columns of fields on the page (1 to 2)	Retail: 1 Other: 2	

Note: The following query parameters are obsolete:

- **PageWidth** – The parent page determines the iframe width. The child page then takes 100 percent of that width up to a maximum width limit.
- **PageBackgroundColor** – The body and the form of the child page should be transparent, so that the background of the parent page is visible, even when the background is an image.

You can test the style parameter by using the sample MerchantWeb project.



Select a transaction type

Transaction setup

Industry type: Ecommerce

(●) Tokenize only
( ) Authorize
( ) Authorize+Capture

[✓] Support card tokenization
[ ] Support card swipe
[ ] Support voice authorization
[✓] Show 'Same as shipping address'

Locale: en-US

Host page setup

Page background color: white
IFrame width: 920px

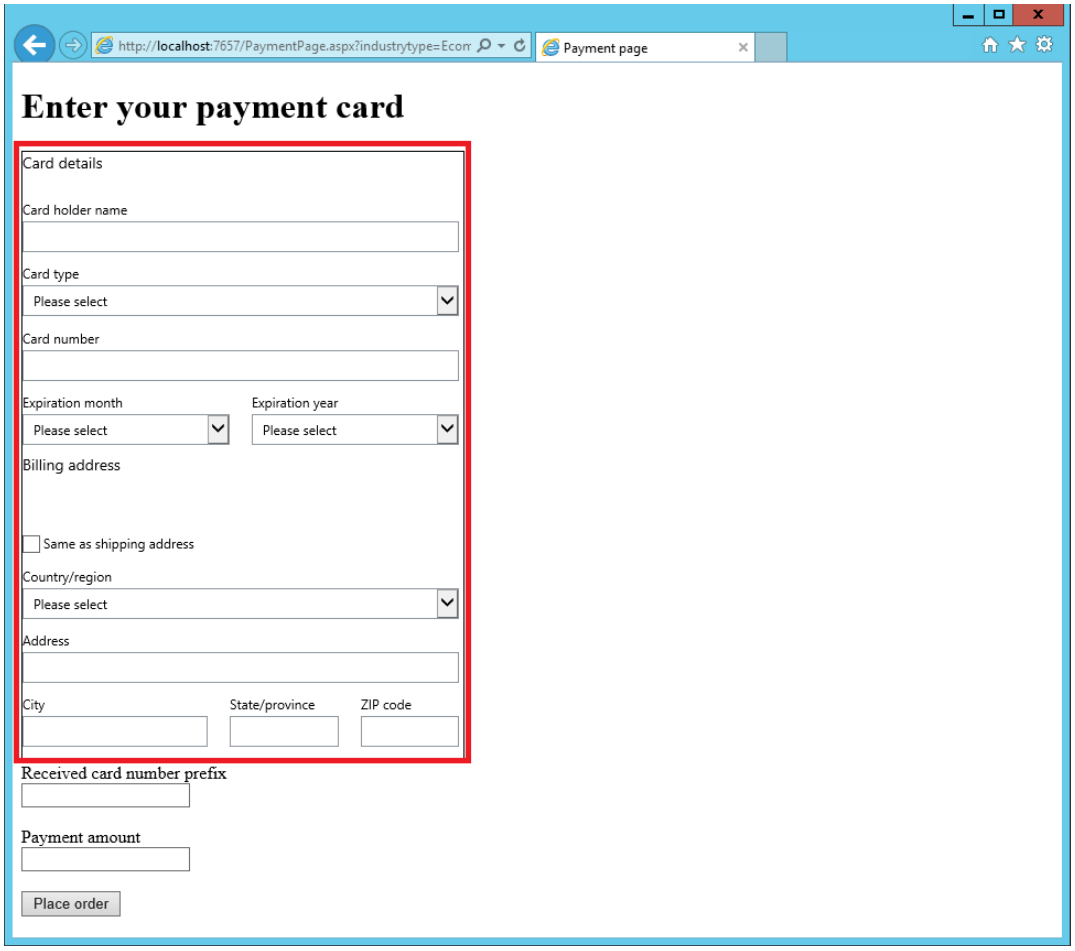
Accepting page URL parameters

Font size: 12px
Font family: "Segoe UI"
Label color: black
Text background color: white
Text color: black
Disabled text background color: #E4E4E4
Column number: 2

Next

Note: When the industry type is **Retail**, the payment accepting page always has one column, because there are fewer display fields. When the industry type is **Direct Marketing** or **Ecommerce**, the page can have two columns (for desktop computers) or one column (for mobile devices).

The following screen shot shows the page when **IFrame width** is set to **400px** and **ColumnNumber** is set to **1**.


http://localhost:7657/PaymentPage.aspx?industrytype=Ecom

Payment page

Enter your payment card

Card details

Card holder name

Card type

Please select

Card number

Expiration month

Please select

Expiration year

Please select

Billing address

Same as shipping address

Country/region

Please select

Address

City

State/province

ZIP code

Received card number prefix

Payment amount

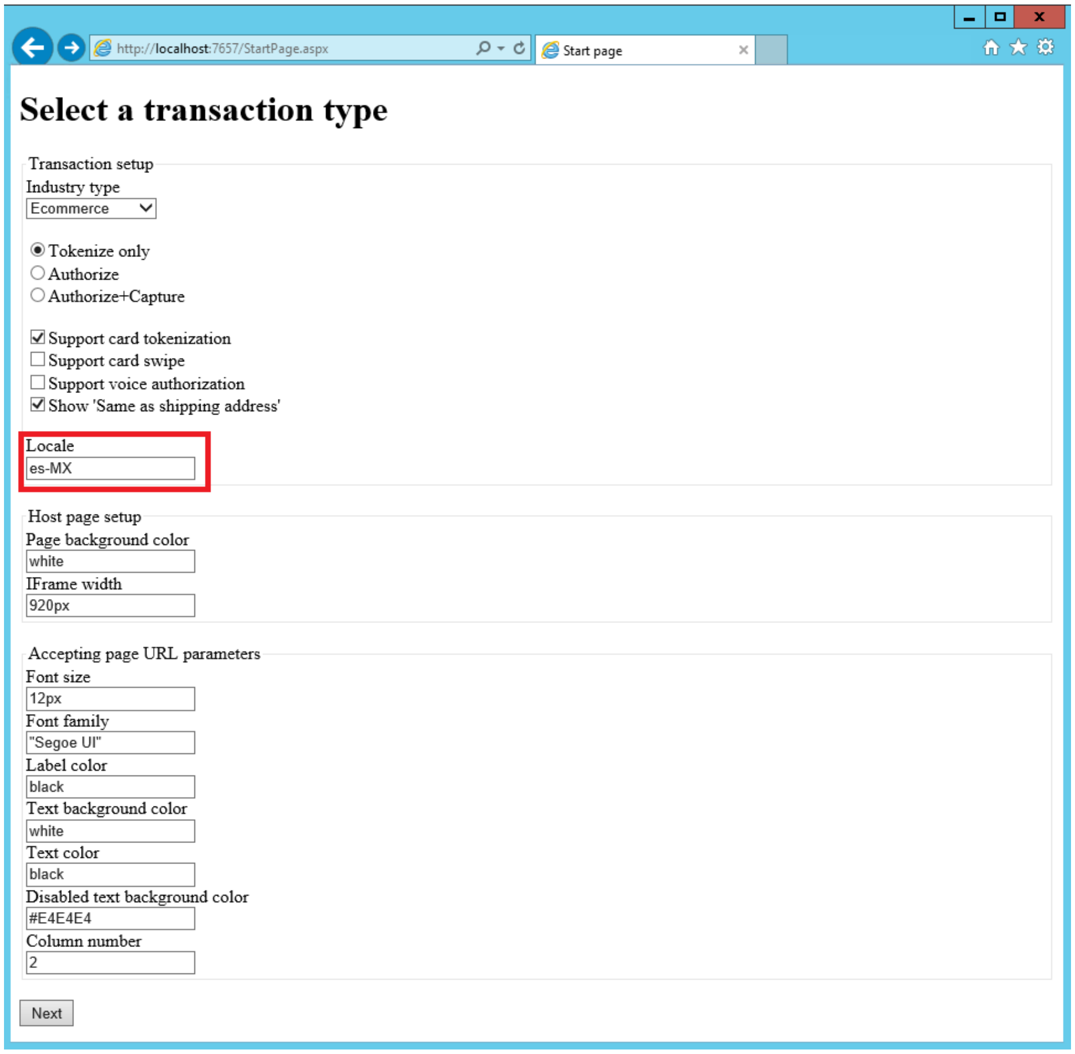
Make sure that you use the same CSS file when you develop your credit card page. Additionally, make sure that you support the custom styles that are mentioned in this section.

Localization

As part of the tokenization request, **RequestLocale** is provided to tell the card page which language to appear in.

In the PaymentAcceptWeb project, all texts were localized in English in the resource file at App_GlobalResources > WebResources.resx. A Spanish resource file was also added, WebResources.es.resx. Currently, only one label is translated into Spanish (and even this label isn't really translated but is a text holder).

You can view the card page in Spanish by setting the locale to **es-MX**.


http://localhost:7657/StartPage.aspx

Start page

Select a transaction type

Transaction setup

Industry type: Ecommerce

(●) Tokenize only
( ) Authorize
( ) Authorize+Capture

[✓] Support card tokenization
[ ] Support card swipe
[ ] Support voice authorization
[✓] Show 'Same as shipping address'

Locale: es-MX

Host page setup

Page background color: white

IFrame width: 920px

Accepting page URL parameters

Font size: 12px

Font family: "Segoe UI"

Label color: black

Text background color: white

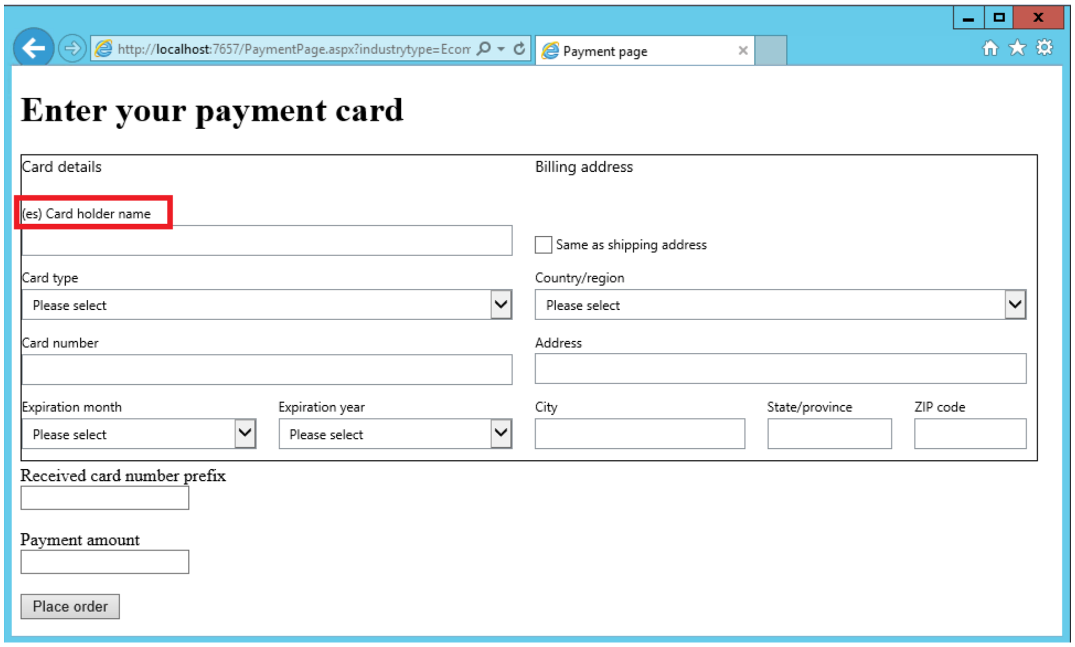
Text color: black

Disabled text background color: #E4E4E4

Column number: 2

Next

After you change the locale, you will see that the label of the **Card holder name** is slightly different. It's now prefixed with **(es)**. Other texts that aren't translated will use the default language, English.



Enter your payment card

Card details	Billing address
(es) Card holder name	☐ Same as shipping address
Card type: Please select	Country/region: Please select
Card number	Address
Expiration month: Please select; Expiration year: Please select	City; State/province; ZIP code

Received card number prefix

Payment amount

Place order

Once again, this section just provides an example. You can choose any localization techniques that are available in your choice of web technology.

Right-to-left

In some languages, such as Arabic, texts start on the right side of the page and continue to the left. The payment accept page must enable right-to-left (RTL) texts when it's displayed in those languages.

The sample PaymentAcceptWeb project enables this feature by setting the **TextDirection** property of the page, based on current UI culture. See the **Page_Load** method of the **CardPage** class.

Messages

Message classes are used as the signature of the web APIs. In PaymentAcceptWeb, we reuse the **Request** and **Response** classes from PaymentSdk. You can find these classes used in the **PaymentsController** class. This reuse of the class from PaymentSdk is just an implementation choice for the sample.

Data access

To facilitate data operations, data model classes are defined under the Models folder, and data manager classes are defined under the Data folder. These classes are only internal implementation samples. You can choose how to implement the data access layer.

In the sample, we host the web application and the database on the same computer. However, you can put them on different servers and expose the data however you want (for example, by using data access services).

Payment processing

When the card data is ready for payment processing, you can call the front-end payment service directly. Alternatively, you can call methods on the payment connector. The payment connector will then call the front-end payment service. The sample uses the second approach in the **ProcessPayment** method of **CardPage** class. If you use the same approach, you must include your payment connector in your payment accepting application.

Card input modes

The payment accepting page supports three modes for entering a credit card:

- **Swipe card** – This mode is available only when the **SupportCardSwipe** payment property is set to **true**. In this mode, the page listens to fast-track data entry and parses it into card data, such as a card number. When the card input mode isn't Swipe card, any card swipe data should be ignored.
- **Enter manually** – This mode is always available. In this mode, fields such the card number are enabled for manual input.
- **Voice authorization** – This mode is available only when the **AllowVoiceAuthorization** payment property is set to **true**. This mode is similar to Enter manually mode, but it has an extra field, **Voice authorization code**.

Error handling

When the payment accepting page is triggered to submit a payment, five types of errors can occur. We handle each type of error differently.

- **Input validation errors** – For example, the card number is missing. Any input errors should be sent via cross-domain messaging (by using the **msax-cc-error** message type), so that the parent page displays the errors for the end user.
- **Card tokenization errors** – When the **SupportCardTokenization** payment property is set to **true**, the page first tokenizes the credit card. Any errors or failures during card tokenization should also be sent via cross-domain messaging (by using the **msax-cc-error** message type).
- **Payment authorization errors** – When the transaction type is **Authorize** or **Capture**, the page authorizes a credit card payment. Any errors or failures during card tokenization should also be sent via cross-domain messaging (by using the **msax-cc-error** message type).
- **Capture errors** – When the transaction type is **Capture**, after the page authorizes a credit card payment, it captures that payment. If capture fails, you must first void the authorization. Additionally, you must produce a payment result and send the parent page the result access code (by using the **msax-cc-result** message type). We handle capture errors differently, because a payment has already been authorized before capture. That authorization must be voided, and all the payment information must be sent to the merchant application, so that the credit card holder can be notified.
- **Other system errors** – Any other unhandled errors or exceptions forward the page to a generic error page (GenericErrorPage.html). The application should not typically reach that page, unless the system is down or there is a bug in the application.

Data encryption

If the PaymentAcceptWeb application temporarily stores merchant credentials and credit card data, as the sample does, that data must be encrypted in the database.

In the sample, see App_Data/Tables.sql, where we enabled Transparent Data Encryption (TDE) for Microsoft SQL Server. This feature encrypts all data in the CardPaymentAccept database.

Data purge

You might want to consider deleting a payment entry and payment result pair after the payment result is retrieved. Additionally, you should clean data periodically, because some payment entries might never be used, and some payment results might never be retrieved.

In the sample, see Jobs.sql, where we schedule a job that the SQLServerAgent service runs to purge the payment history once a day.

Scalability

In the sample, all payment-related tables (CARDPAYMENTENTRY and CARDPAYMENTRESULT) contain the **SERVICEACCOUNTID** field, which holds an identifier for the merchant. By partitioning the data by the **SERVICEACCOUNTID** field, you can scale out to multiple databases.

You can also scale out the web application, depending on the implementation technology that you choose.

Refunds

The payment accepting page must **not** support payment refunds. We have deliberately left out refund functionality. Instead, when you must refund payments, the merchant app first tokenizes a card by using the payment accepting page and then refunds the payment by using the card token.

What isn't included

The sample PaymentAcceptWeb project is only a sample to show you how to implement the payment accepting application. For the sake of simplicity, we didn't address the following issues in the sample. However, you should address these issues in your final product:

- (Required) The web app must disable HTTP and allow only HTTPS.
- (Required) The sample app isn't certified by the payment card industry (PCI). You must follow appropriate PCI standards and become certified before you launch the app in production.
- (Optional) The card page and web APIs can be hosted separately.
- (Optional) Logging and tracing.
- (Optional) Auditing.

- (Optional) Denial of service attacks prevention. To address this issue, you might have to implement the necessary throttling feature, an error notification feature, and other prevention measures on the host server.
- (Optional) Server authentication. When a client calls a service, such as GetPaymentAcceptPoint, the client is authenticated based on the merchant credentials. However, for this example, the service server isn't authenticated.

This list isn't exhaustive. You're welcome to contact us to discuss other issues that you should address.

Part 3: Implementing a payment device

Hardware Station uses the payment device mainly to communicate with the payment terminal and call the payment connector to make payments. We have created sample payment device implementations for each of the following payment terminals:

- Hypercom L5300
- VeriFone Mx925 (Forms)
- SampleDevice (Template)

Methods

This section describes each method in the interface and explains its purpose.

Task OpenAsync(string peripheralName, SettingsInfo terminalSettings, IDictionary<string, string> deviceConfig)

This method initializes the payment terminal so that it's ready to begin a transaction. The **deviceConfig** parameter enables the client to send configuration settings that aren't available in Dynamics AX, but that are required in order to load the payment terminal. In the following example for the VeriFone Mx925, TCP/IP is used for communication.

```
{ "Transport", "TCP" }, { "IPAddress", "10.125.226.147" }, { "Port", "5015" }, {"AccessCode", "7654" }
```

Task CloseAsync()

This method closes the connection to the payment terminal.

Task BeginTransactionAsync(PaymentProperty[] merchantProperties, string connectorName, string invoiceNumber, bool isTestMode)

This method begins the payment terminal transaction. The following information is passed to the method:

- The payment provider merchant properties that are required for the payment connector
- The payment connector name that has been set up in Dynamics AX, so that this channel can make payments

- The invoice number that is associated with the transaction
- A flag that indicates whether payments should be made to a test environment instead of a production environment

The method also defines payment terminals settings, such as upper and lower limits, cashback amounts, and signature approval limits. The limits are defined in Dynamics AX, but some payment terminals can be set up only by the terminal supplier.

Task EndTransactionAsync()

This method ends the payment terminal transaction.

Task UpdateLineItems(string totalAmount, string taxAmount, string discountAmount, string subTotalAmount, IEnumerable<ItemInfo> items)

This method displays items and totals to the payment terminal screen, if this feature is supported. This method is called every time that an item is added to or removed from the POS cart.

Task<PaymentInfo> AuthorizePaymentAsync(decimal amount, string currency, string voiceAuthorization, bool isManualEntry)

This method performs the following tasks:

- Fetch the tender to authorize the payment.
- Get the tender type (debit or credit).
- If the tender type is debit, get the personal identification number (PIN) entry.
- Get the signature approval, if this type of approval is required.
- Make the authorization call to the payment gateway.
- If the payment terminal supplies receipt data as XML, add it to the **ExternalReceipt** property in **AuthorizationResponse**. In this case, standard Dynamics AX receipts won't be printed. Instead, this XML data will be used to print the receipt.

Task<PaymentInfo> CapturePaymentAsync(decimal amount, string currency, PaymentProperty[] paymentProperties)

This method settles the authorization with the payment gateway. The payment processing state is persisted in the **AuthorizationResponse** payment properties that are passed into this method.

Task<PaymentInfo> VoidPaymentAsync(decimal amount, string currency, PaymentProperty[] paymentProperties)

This method calls the **Void**/**Reversal** method on the payment gateway. Once again, the payment processing state is persisted in the **AuthorizationResponse** payment properties that are passed into this method.

Task<PaymentInfo> RefundPaymentAsync(decimal amount, string currency, bool isManualEntry)

This method is very similar to the **Authorize** method, but it refunds funds to the customer's account.

Task<PaymentInfo> FetchTokenAsync()

This method fetches the tender and then creates a token of the credit card number. Typically, a token is generated by a payment gateway and stored by a client for future use.

Task CancelOperationAsync()

This method tries to cancel any operation that the terminal is processing.

Extensibility in Dynamics AX

In the current version of Dynamics AX, a new **extensionTransactionProperties** parameter of the **ExtensionTransaction** class was added to **AuthorizePaymentAsync()**, **CapturePaymentAsync()**, **VoidPaymentAsync()**, and **RefundPaymentAsync()**. This parameter lets partners and customer pass in an array of key-value pairs to the payment device.

Additionally, a new method that is named **ExecuteTaskAsync(string task, ExtensionTransaction transactionProperty)** was added to let partners and customers call their own tasks on the payment device. These tasks include displaying an email dialog box, displaying a customer message, and displaying a donation message.

These extensions let customers and partners customize the Retail Modern POS (MPOS) system to meet the requirements of different industries and countries/regions.

Processing the payment by using a payment connector

If the payment device doesn't handle the payment processing for the transaction, you must call **CardPaymentManager.Chained*Call()** (where ***** = **Authorize**, **Refund**, **Void**, or **Capture**). For examples that show what to pass to this method, and how, see the samples (SampleL5300 and SampleMx925). We have added the new chained payment processors to enable different payment connectors to handle different payments. For example, the device returns a gift card that the first payment connector can't handle. This gift card is then passed to the second payment connector, which processes the payment.

Exception handling

The client expects only the following types of exceptions:

- PeripheralException
- PaymentException
- CardPaymentException

The error resource identifier should be one of the constant strings on the class, such as **PeripheralException.PaymentTerminalError**.

If the device handles the payment processing, you must throw the following exception if the authorization is declined, and so on:

CardPaymentManager.VerifyErrors("AuthorizePaymentAsync", result.PaymentErrors, PaymentErrors.UnableToAuthorizePayment);

Summary

The payment connector instance is passed to the payment device to make payments. However, the payment device implementation determines whether it will make its own payments by using the payment terminal hardware or whether it will call the payment connector. Helper classes have been supplied in the peripherals assembly to convert to and from payment SDK request and response objects for each payment transaction type.

The external receipt must be in the following format.

```
<ReceiptData>
    <Receipt Type='Customer'>
        <Line> Line 1 of receipt </Line>
        <Line> Line 2 of receipt </Line>
        ...
    </Receipt>
    <Receipt Type='Merchant'>
        <Line> Line 1 of receipt </Line>
        <Line> Line 2 of receipt </Line>
        ...
    </Receipt>
</ReceiptData>
```

Change history

Date	Version number	Changes
September 4, 2015	7.0.1.0	First version that has a version number and change history
September 21, 2015	7.0.1.1	• Enumeration types: Add a new section to list all enum types. • Cross-domain messaging: Add two new messages, **msax-cc-partialamount** and **msax-cc-partialok**, for the partial authorization scenario. Add one new message, **msax-cc-swipe**, for passing the track data.
October 23, 2015	7.0.1.2	Minor correction

Date	Version number	Changes
November 19, 2015	7.0.1.3	• Add the **PaymentAcceptAdaptorPath**, **PaymentAcceptMessageOrigin**, **PaymentAcceptSubmitUrl**, and **BankIdentificationNumberStart** properties. • Mark a few parameters on the payment accepting page as "will be deprecated."
December 7, 2015	7.0.1.4	• Starting with dev build 7.0.1201.0, the following items are obsolete: • The **msax-cc-width** message • The **msax-cc-cardtype** message • The **PageWidth** query parameter • The **PagebackgroundColor** query parameter • Update all screenshots of the merchant web app and the payment accepting web app.

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