Deep Dive into the Payment Request API

By Matt Gaunt

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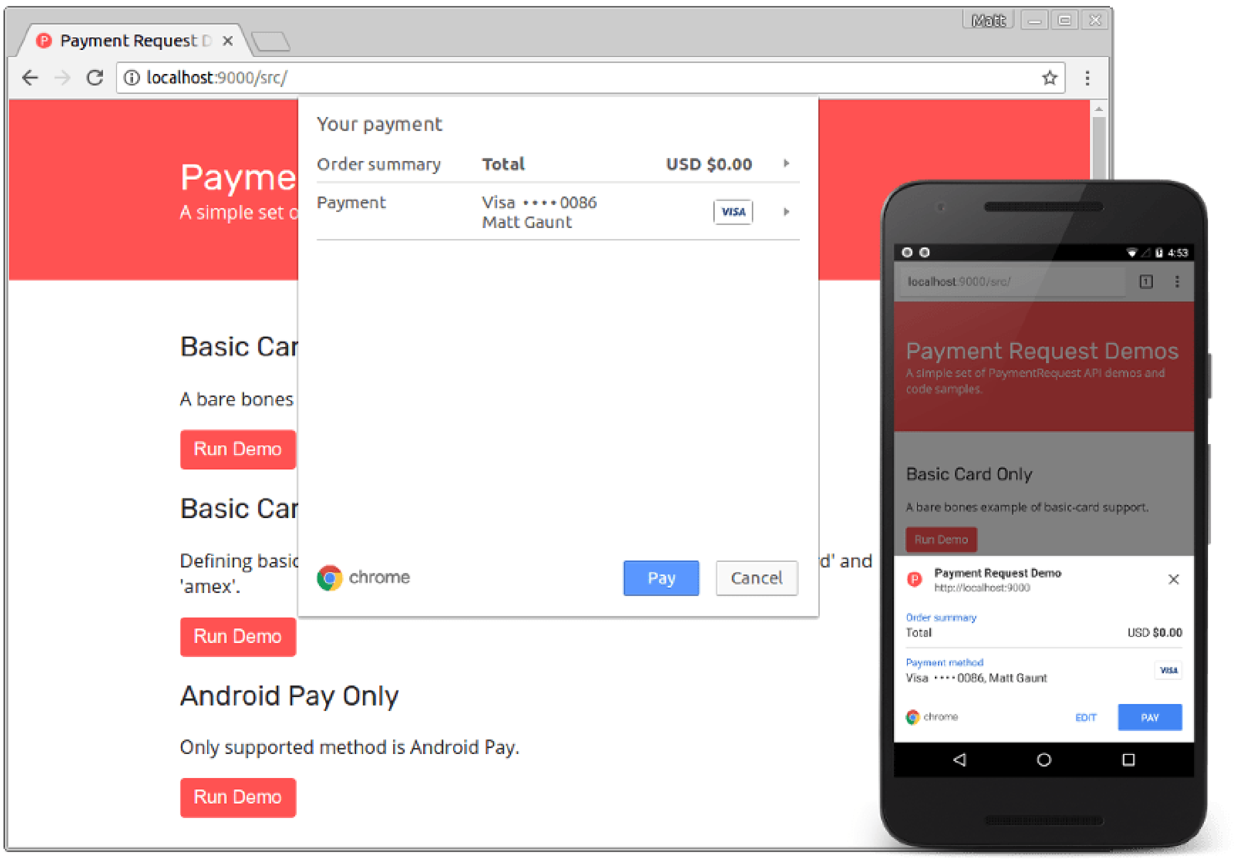


Payment request UI on desktop and mobile Chrome.

In this guide we'll explore the ins and outs of the Payment Request API, looking at how our input affects the payment request UI, how we can request information from the user (like name and phone number), and how the final payment and user information is passed to your site.

If you are unsure of what the Payment Request API is or why it's useful, check out the introduction article.

One thing to keep in the back of your mind when working with the Payment Request API is that the API manages the UI but performs no arithmetic; it will simply display whatever input you pass to it. Throughout the examples we'll discuss what this means for the developer and user.

Dogfood: `PaymentRequest` is still in development. While we think it's stable enough to implement, it may continue to change. We'll keep this page updated to always reflect the current status of the API. Meanwhile, to protect yourself from API changes that may be backwards incompatible, we're offering a shim that can be embedded on your site. The shim will paper over any API differences for two major Chrome versions.

Feature Detect

Payment Request has been available since Chrome 53 for Android and has been enabled by default since Chrome 61 on desktop. Before we start covering how to use Payment Request, we should feature detect to ensure it's available and fallback to a traditional checkout page in browsers that don't support it.

The feature detect is simply:

```
if(window.PaymentRequest) {
  // Use Payment Request API
} else {
  // Fallback to traditional checkout
  window.location.href = '/checkout/traditional';
}
```

Note: Payment Request is only available on sites served over HTTPS.

PaymentRequest Constructor

Once you are ready to collect payment details from the user, you'll need to construct a new PaymentRequest object.

```
const supportedPaymentMethods = [
  {
    supportedMethods: 'basic-card',
  }
];
const paymentDetails = {
  total: {
    label: 'Total',
    amount:{
      currency: 'USD',
      value: 0
    }
  }
};
// Options isn't required.
const options = {};

new PaymentRequest(
  supportedPaymentMethods,
  paymentDetails,
  options
);
```

The constructor takes three arguments. The first argument defines which forms of payment you can accept; for example, you may only accept 'visa' and 'mastercard'. The paymentDetails argument defines the total and display items. The optional third argument is an object used to request additional information from the user; for example, you can request the payer's name, email address, and phone number.

All of these options affect the UI presented to the user as well as the amount of information the browser will need to collect from them.

Constructing a new `PaymentRequest` object can be done at any point in your app. Nothing will be shown to the user until you call its `show()` method.

```
const request = new PaymentRequest(
  supportedPaymentMethods,
  paymentDetails,
  options
);

// Call when you wish to show the UI to the user.
request.show()
.then(...).catch(...);
```

Let's start by looking at the arguments we can pass into the `PaymentRequest` constructor, starting with the supported payment methods.

Defining Supported Payment Methods

The Payment Request API is designed to support credit and debit card payments as well as third party payment methods (such as Google Pay).

You must supply an array of objects indicating your supported payment methods where each payment method must include a **`supportedMethods`** parameter that identifies the payment method. Each object can contain an optional **`data`** object.

```
const supportedPaymentMethods = [
  {
    supportedMethods: 'name-of-payment-method',
    data: {
      // Optional data for this payment method
    }
  }
];

new PaymentRequest(supportedPaymentMethods, paymentDetails, options);
```

First we'll look at how to define support for credit and debit cards, followed by a brief look at supporting Google Pay.

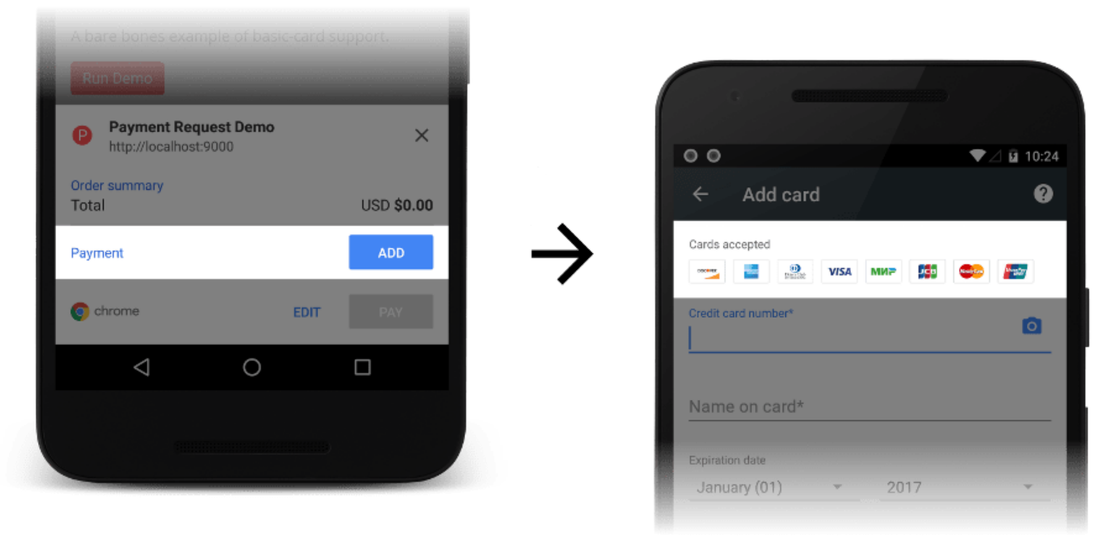
Payment Method: 'basic-card'

To support credit and debit cards, we need to change the **`supportedMethods`** parameter to 'basic-card', like so:

```
const creditCardPaymentMethod = {
  supportedMethods: 'basic-card',
};

const supportedPaymentMethods = [creditCardPaymentMethod];

new PaymentRequest(supportedPaymentMethods, paymentDetails, options);
```

If the user has no cards set up they'll be prompted to add details, otherwise an existing card will be selected for them.

Note: To get access to all forms of payment available with Google, developers will need to implement the Google Pay method. Refer to the Google Pay API docs for more information.



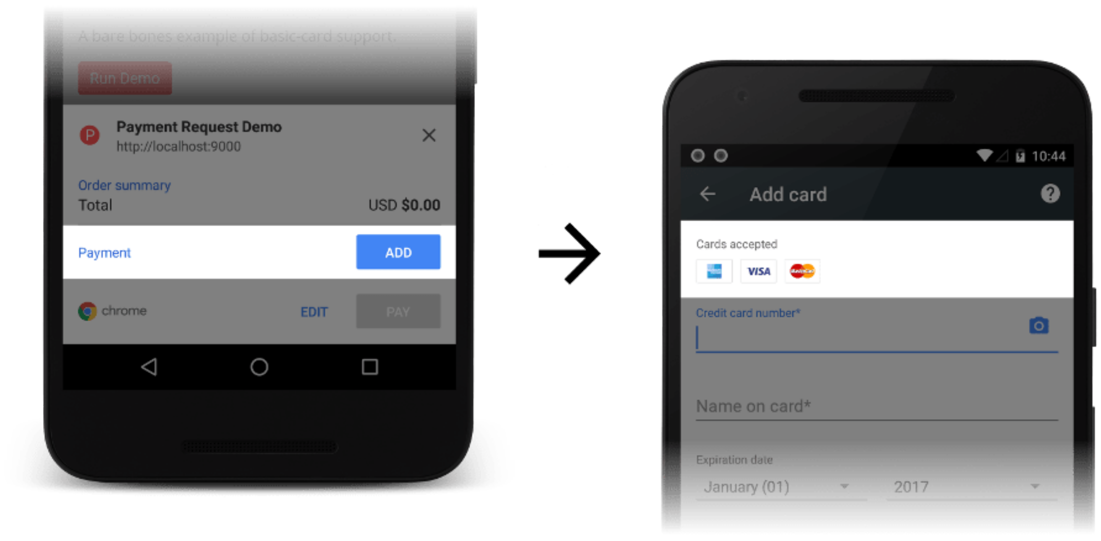
Example of basic-card support in the Payment Request API.

At the time of writing, Chrome supports `amex`, `diners`, `discover`, `jcb`, `mastercard`, `unionpay`, `mir`, and `visa`, which you can see listed across the top of the UI. Find out up to date list of approved card identifiers in the spec.

To restrict the supported cards, we can add the optional data parameter and define `supportedNetworks`. The following code restricts the accepted cards to visa, mastercard and amex.

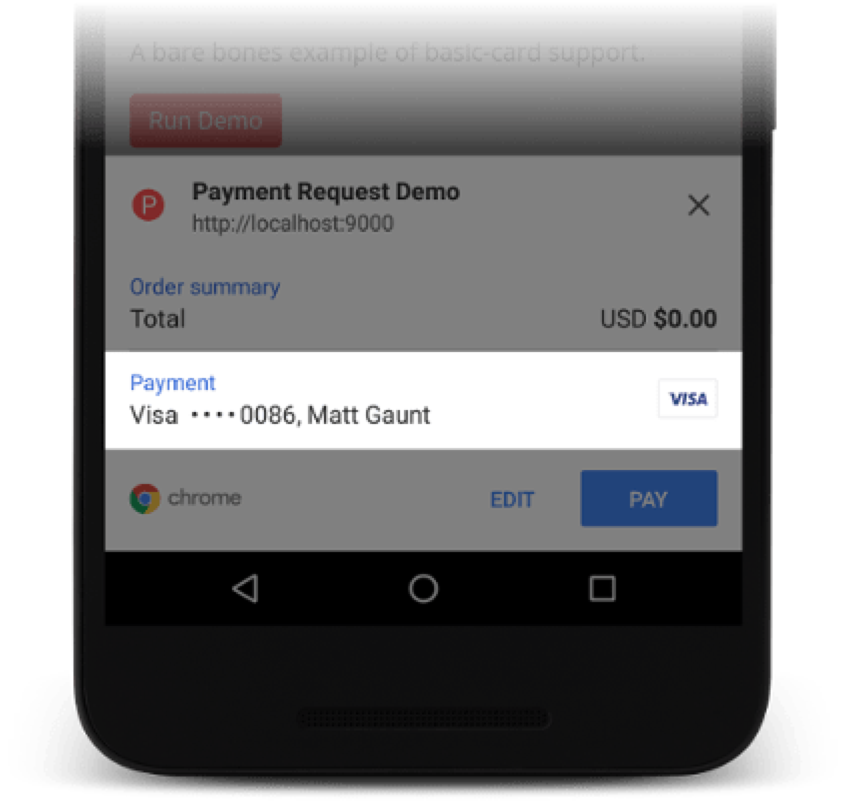
```
const creditCardPaymentMethod = {
  supportedMethods: 'basic-card',
  data: {
    supportedNetworks: ['visa', 'mastercard', 'amex'],
  },
};
```

The payment request UI will restrict the accepted cards and the user will be prevented from selecting other cards:



Example of reduced the list of supported cards in the Payment Request API.

In the screenshot above, the user must add a payment. If browsers have this information readily available, they have the option of pre-selecting an appropriate payment for the user. This means that the wider your card support, the higher the odds are of the browser being able to pre-populate these details, speeding up the checkout flow. For example, if I had a card saved in Chrome, the UI would start with a suitable card already selected:



Cards will be preselected if available.

The **supportedTypes** parameter tells Chrome which types of cards to filter out, i.e. if a merchant defined **supportedTypes** as `['credit', 'debit']`, Chrome would strip out any 'prepaid' cards the user has.

This means that **supportedTypes** **does not guarantee** that the final card you receive will be a supported type. The user can enter details for a new card, which could be an unsupported type, and the Payment Request API will allow this. The **supportedTypes** option is **just** for filtering out existing cards. Merchants still need to check the card type on their backend.

Chrome version 61 added support for the **supportedTypes** option. In older versions of Chrome you would receive the following console warning:

```
Cannot yet distinguish credit, debit, and prepaid cards.
```

It's safe to use this option. The only difference is that some cards wouldn't be filtered automatically for the user.

```
const creditCardPaymentMethod = {
  supportedMethods: 'basic-card',
  data: {
    supportedNetworks: ['visa', 'mastercard', 'amex'],
    supportedTypes: ['credit', 'debit'],
  },
};
```

Payment Method: Multiple Payment Methods

In the above example for basic cards, we created an object `creditCardPaymentMethod` and we passed that into an array before giving it to the `PaymentRequest` constructor.

```
const creditCardPaymentMethod = {
  supportedMethods: 'basic-card',
};

const supportedPaymentMethods = [creditCardPaymentMethod];

new PaymentRequest(supportedPaymentMethods, paymentDetails, options);
```

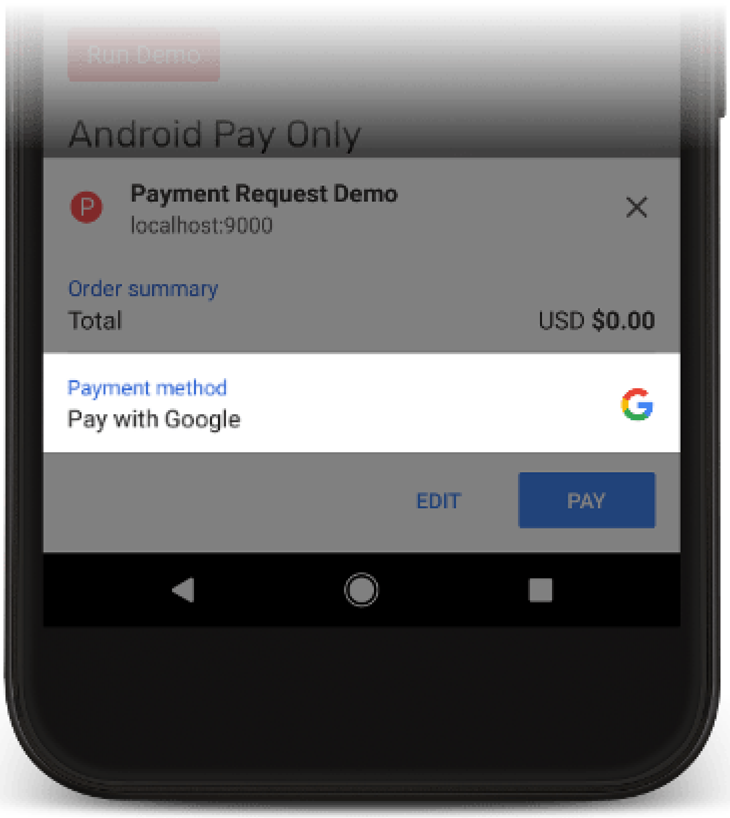
The reason for putting `creditCardPaymentMethod` into an array is to cater for scenarios where a merchant supports multiple payment methods. For example, let's say there was a payment processor called "BobPay" and you (the merchant) accepted payments through BobPay as well as credit cards. You'd define the supported payment methods like so:

```
const creditCardPaymentMethod = {
  supportedMethods: 'basic-card',
};

const bobPayPaymentMethod = {
  supportedMethods: "https://example.com/bobpay",
  data: {
    merchantIdentifier: "XXXX",
    bobPaySpecificField: true
  }
};

const supportedPaymentMethods = [
  creditCardPaymentMethod,
  bobPayPaymentMethod
];

new PaymentRequest(supportedPaymentMethods, paymentDetails, order);
```

If the browser can support the BobPay payment method it will offer it to the user alongside credit cards.

An example of using a third party payment processor like this can be shown with "Google Pay", which is supported on Chrome for Android.

```
const googlePayPaymentMethod = {
  supportedMethods: 'https://google.com/pay',
  data: {
    'environment': 'TEST',
    'apiVersion': 1,
    'allowedPaymentMethods': ['CARD', 'TOKENIZED_CARD'],
    'paymentMethodTokenizationParameters': {
      'tokenizationType': 'PAYMENT_GATEWAY',
      // Check with your payment gateway on the parameters to pass.
      'parameters': {}
    },
    'cardRequirements': {
      'allowedCardNetworks': ['AMEX', 'DISCOVER', 'MASTERCARD', 'VISA'],
      'billingAddressRequired': true,
      'billingAddressFormat': 'MIN'
    },
    'phoneNumberRequired': true,
    'emailRequired': true,
    'shippingAddressRequired': true
  },
};
```



Google Pay example in payment request UI.

We won't go into details of how to add Google Pay in this article, we have a dedicated document to that.

Edge Cases

There are some edge cases to be aware of when defining your supported payment methods.

Unsupported Payment Methods If you try to call `show()` on a `PaymentRequest` object and there are no supported payment methods, the returned promise will reject immediately with the following error:

```
DOMException: The payment method is not supported
```

This shouldn't be a problem if you include 'basic-card' as a supported payment method. If, however, you only support a third party payment method, like Google Pay, there is a strong chance that it won't be supported by a browser that supports the Payment Request API.

Third Party Payment Method Skipping the Payment Request UI In the screenshot above you can see "Google Pay" as the pre-selected payment option. This has occurred because the example supports both Google Pay and basic cards. If you define Google Pay as your **only** payment method and the browser supports it, and no additional data is requested from `PaymentOptions`, the browser can (and Chrome does, at the time of writing) skip the payment request UI altogether after the `show()` method is called Users will be taken straight to Google Play services to complete the payment.

Defining Payment Details

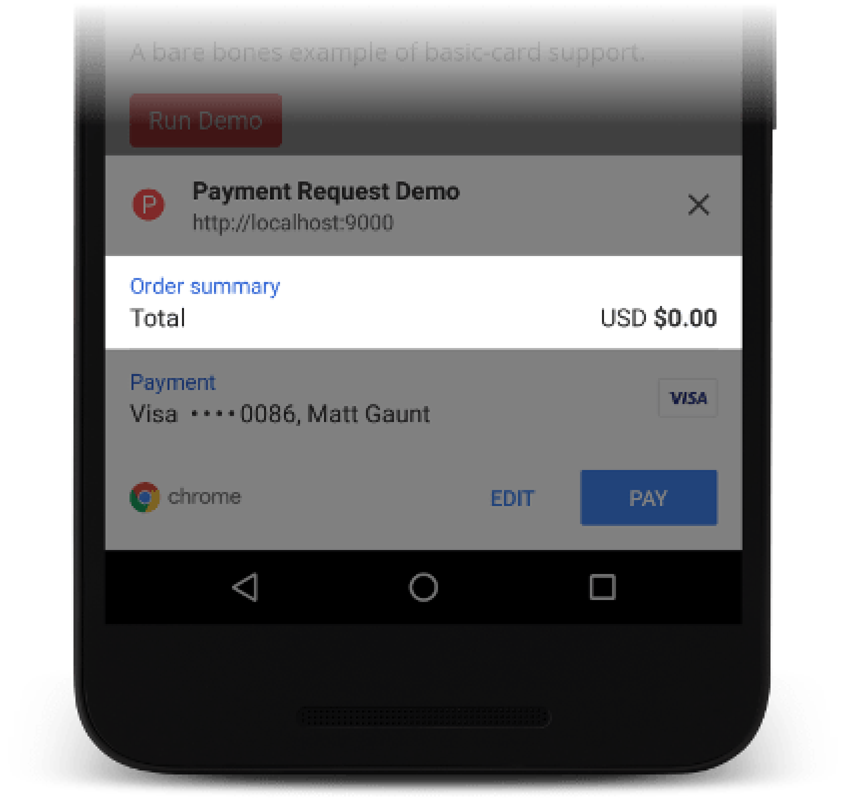
The second argument we need to pass to the `PaymentRequest` constructor is the payment details object. This object contains the total for the order and an optional array of display items (i.e. a high level breakdown of the total).

Transaction Details: Total

The contents of the `total` parameter should contain a `label` parameter and an `amount` parameter consisting of a `currency` and `value`. A basic example would be:

```
const paymentDetails = {
  total: {
    label: 'Total',
    amount: {
      currency: 'USD',
      value: '0',
    },
  },
};

new PaymentRequest(supportedPaymentMethods, paymentDetails, options);
```

This controls the "order summary" section of the UI:



How the total parameter affects the UI.

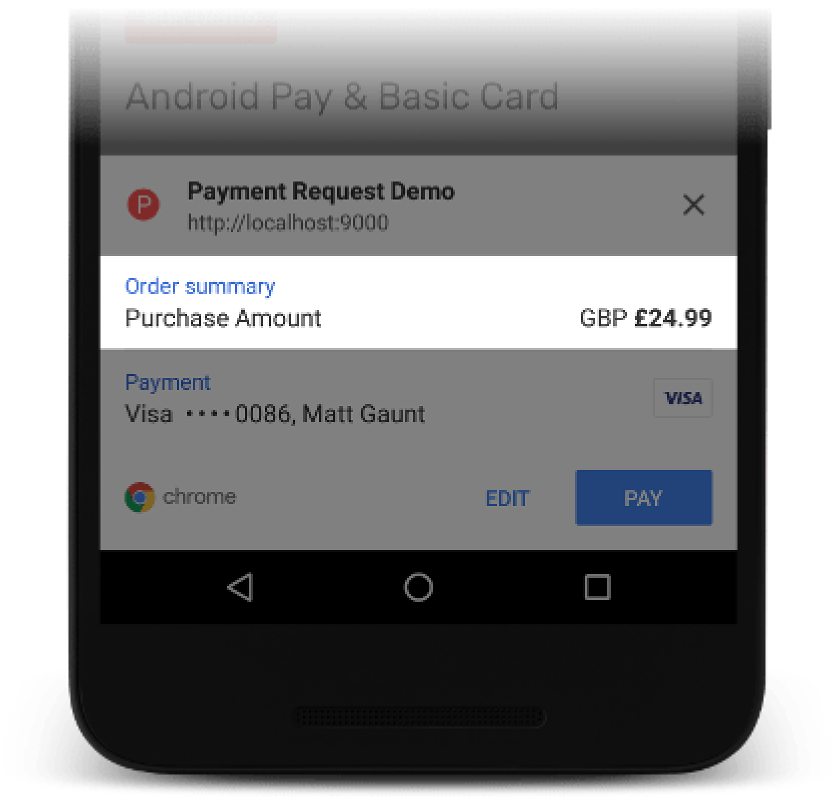
The **`total`** parameter is the only *required* piece of information in the payment details object.

The **`label`** can be any piece of text you like, the **`currency`** must be a string currency code following the ISO 4217 standard, and the **`value`** is the amount for the order.

To give another example, we can define the total as:

```
const paymentDetails = {
  total: {
    label: 'Purchase Amount',
    amount: {
      currency: 'GBP',
      value: '24.99',
    },
  },
};
```

This produces the following order summary:



Another example of how the total parameter affects the UI.

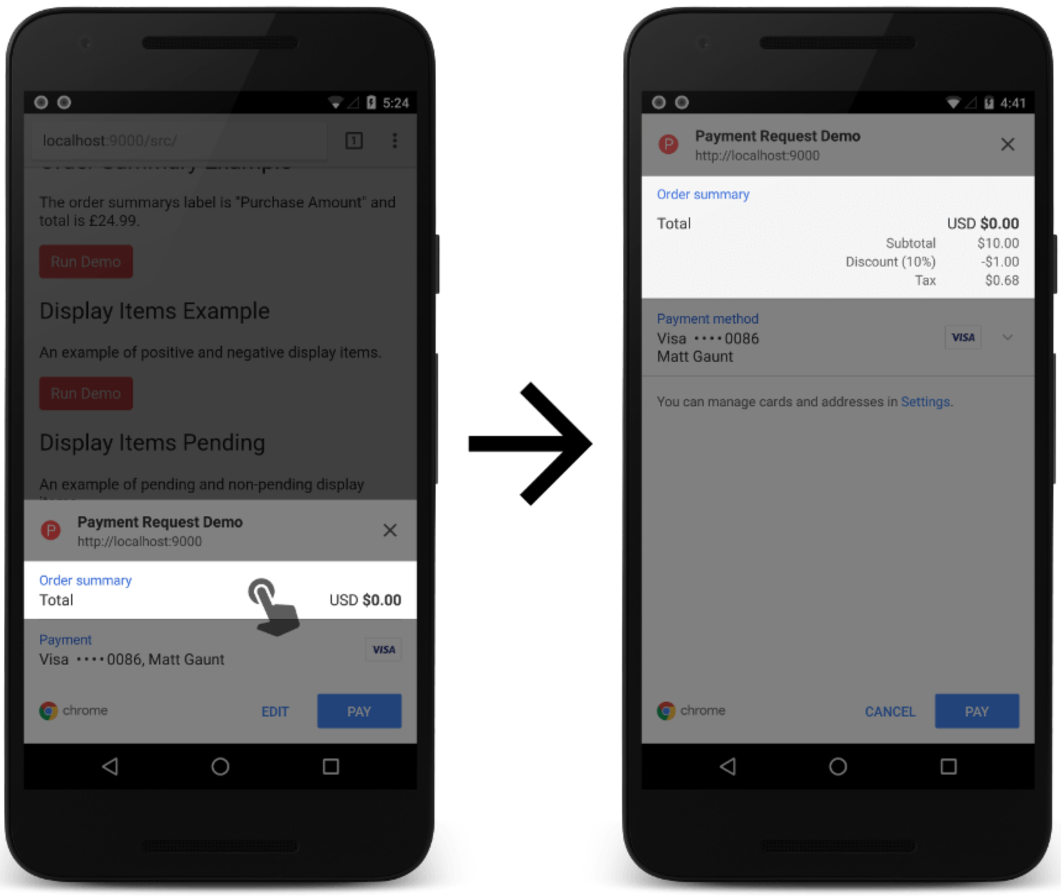
Transaction Details: Display Items

Display items can used to provide a high level breakdown of the total. This would typically include subtotal, tax, deductions, and shipping cost.

The format of the display items should be an array of items following the same structure as the total (i.e., a `label` and an `amount` with `currency` and `value`).

```
const allDisplayItems = [
  {
    label: 'Subtotal',
    amount: {
      currency: 'USD',
      value: 10,
    },
  }, {
    label: 'Discount (10%)',
    amount: {
      currency: 'USD',
      value: -1,
    },
  }, {
    label: 'Tax',
    amount: {
      currency: 'USD',
      value: 0.68,
    },
  },
];

const paymentDetails = {
  total: {
    label: 'Total',
    amount: {
      currency: 'USD',
      value: 0,
    },
  },
  displayItems: allDisplayItems,
};
```

If we provided the above example, we'd get the following UI.



Displaying the items from the payment details object.

The order of the items in the **`displayItems`** array will dictate their display order in the UI.

Please bear in mind that **`displayItems`** are not designed to display a long list of items. You should use this for high level entries instead of an itemized list, for example subtotal, discount, tax and shipping cost.

It's worth repeating that the `PaymentRequest` API does not perform any arithmetic. If you look at the above example, all the items values do not add up to the total. This is because we've set the total to have a value of zero. **It is the responsibility of your web app to calculate the correct total.**

Transaction Details: Display Items - Pending

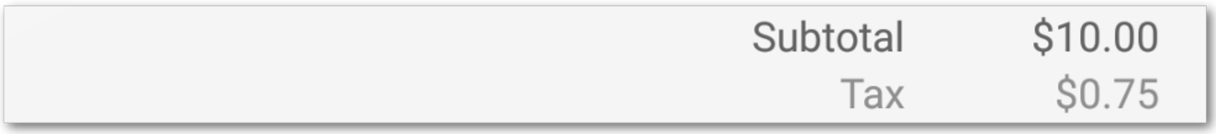
If you have values that aren't final because they require additional information, you can use the **`pending`** parameter.

An example use case for this is marking tax as a pending value until the user has selected a shipping option, which may adjust the total and tax amounts.

In the following example, I've set pending to true on the tax entry:

```
const transactionDisplayItems = [
  {
    label: 'Total cost of goods',
    amount: {
      currency: 'USD',
      value: 10,
    },
  }, {
    label: 'Tax',
    pending: true,
    amount: {
      currency: 'USD',
      value: 0.75,
    },
  },
];
```

Which will be given a slightly different text color in Chrome as a result:

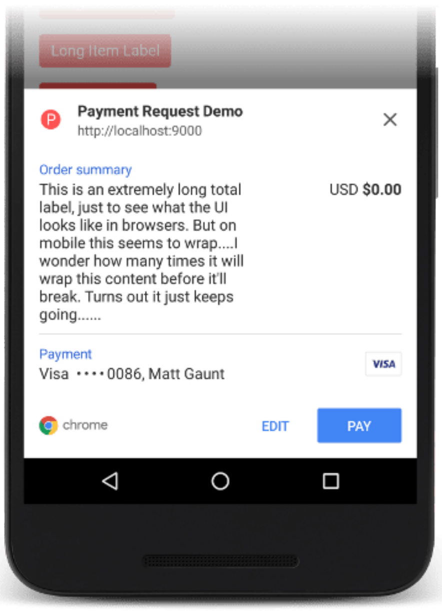


Demonstration of a display item being marked as pending.

Edge Cases

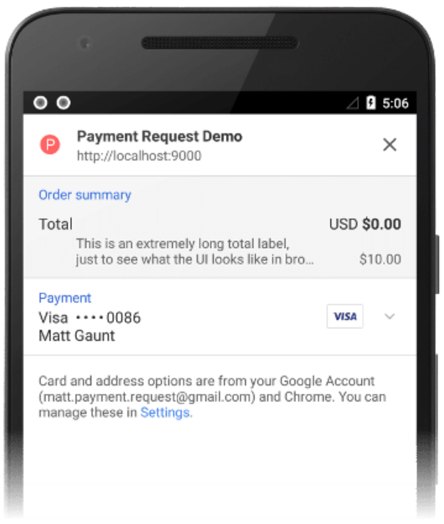
There are some minor edge cases with the `paymentDetails` argument where you can stress the UI and incorrectly define the object resulting in an error.

Long Total Label Be wary of the length of the labels. Browsers have control of how they are displayed. At the time of writing, Chrome doesn't truncate the total label at all, but does truncate display item labels.



This is an extremely long total label, just to see what the UI looks like in browsers. But on mobile this seems to wrap....I wonder how many times it will wrap this content before it'll break. Turns out it just keeps going......

USD $0.00



This is an extremely long total label, just to see what the UI looks like in bro... $10.00

Card and address options are from your Google Account (matt.payment.request@gmail.com) and Chrome. You can manage these in Settings.

Long labels may result in a bad UI for users.

No Total The `total` parameter is a required field; if you fail to include it, you'll receive the following the error:

```
TypeError: Failed to construct 'PaymentRequest': Must specify total
```

Failing to include Label, Amount, Currency or Value If you exclude a `label`, `amount`, `currency`, or `value` from the `total` or one of the `displayItems`, you'll receive one of the following errors:

```
// No label
'PaymentRequest': required member label is undefined.

// No amount
'PaymentRequest': required member amount is undefined.

// No currency
'PaymentRequest': required member currency is undefined.

// No Value
'PaymentRequest': required member value is undefined.
```

If you hit any of these errors, please check the format of the `total` and `displayItems`.

Negative Total (i.e., Refunds) The Payment Request API **does not support negative totals**; if you attempt to show a total with a negative value you'll receive this error:

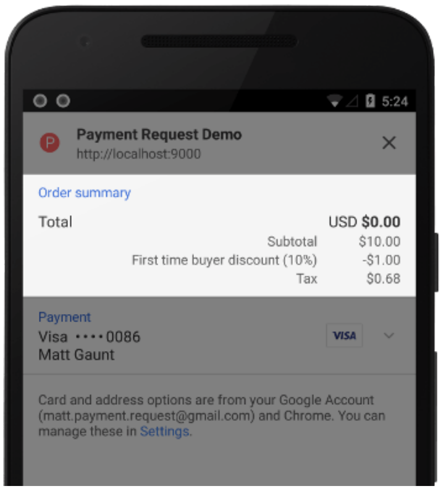
```
'PaymentRequest': Total amount value should be non-negative
```

Invalid Currency The currency code must be three uppercase characters; passing in anything else will throw an error.

```
'PaymentRequest': '...' is not a valid ISO 4217 currency code, should be 3 upper case letters [A-Z]
```

You can pass in any three characters and it will be treated as a valid currency code.The reason for this is that it allows support for future currencies. For example, Bitcoin can be supported with its currency code 'XBT'.

The currency code is always displayed in Chrome at the time of writing, but only known currencies will include the currency character with amounts; otherwise only the currency code is shown. Compare the screenshots below for 'USD' and 'XBT'.



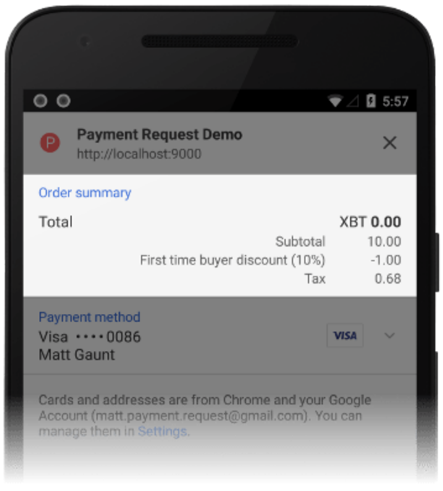
Payment Request Demo
http://localhost:9000

Order summary

Total		USD **$0.00**
	Subtotal	$10.00
	First time buyer discount (10%)	-$1.00
	Tax	$0.68

Payment
Visa ••••0086
Matt Gaunt

Card and address options are from your Google Account (matt.payment.request@gmail.com) and Chrome. You can manage these in Settings.



Payment Request Demo
http://localhost:9000

Order summary

Total		XBT **0.00**
	Subtotal	10.00
	First time buyer discount (10%)	-1.00
	Tax	0.68

Payment method
Visa ••••0086
Matt Gaunt

Cards and addresses are from Chrome and your Google Account (matt.payment.request@gmail.com). You can manage them in Settings.

Comparison of USD and XBT currencies on the payment request UI.

Multiple Currencies At the time of writing, Chrome does not support multiple currencies and unfortunately the error it throws does not make it clear that mixing currencies is not supported.

```
DOMException: Request cancelled
```

You can follow changes to this issue here.

Formatting Currency You can define the `value` parameter as a string, but it must only contain numbers with no more than one decimal point; otherwise you'll receive the following error:

```
'PaymentRequest': '...' is not a valid amount format
```

For example, "1,000.00" is invalid because of the comma, whereas "1000.00" is valid.

Right to Left Languages You can use right-to-left languages for the labels and they will be displayed accordingly. The rest of the browser's text will be determined by the user's browser / system settings.

Defining Options (Optional*)

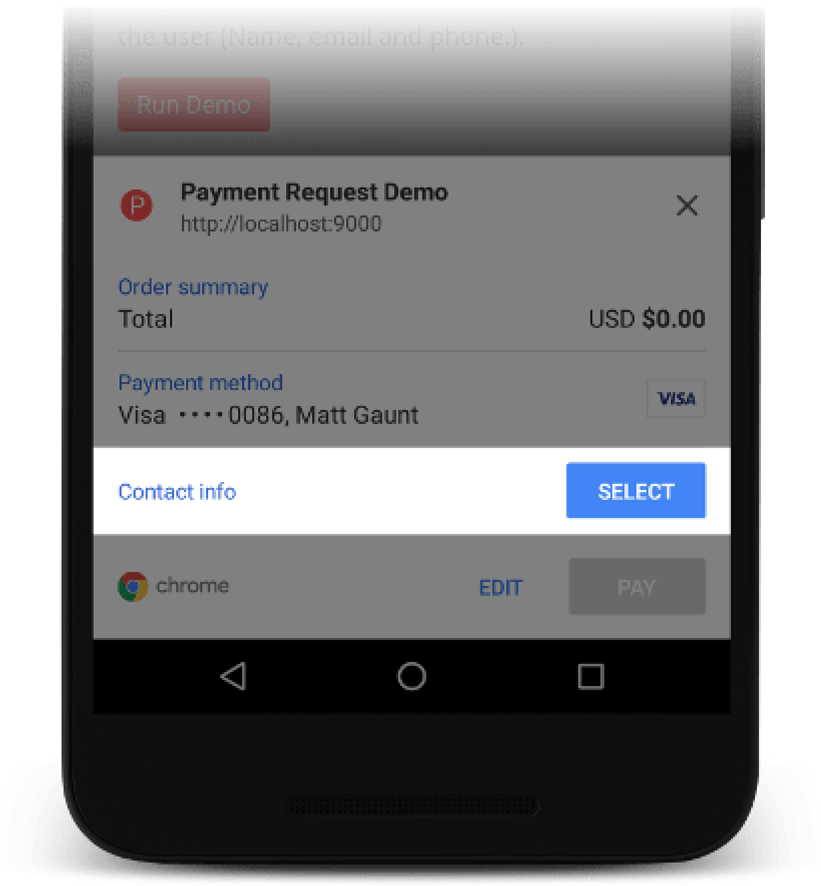
The third argument to the `PaymentRequest` constructor is the optional `options` object.

This object should be used to define any additional information you require from the user including the payer's name, email, and phone number. Only ask for what you need, asking for more details will result in a longer checkout flow for the user.

If you require this information you just need to pass in the following options object:

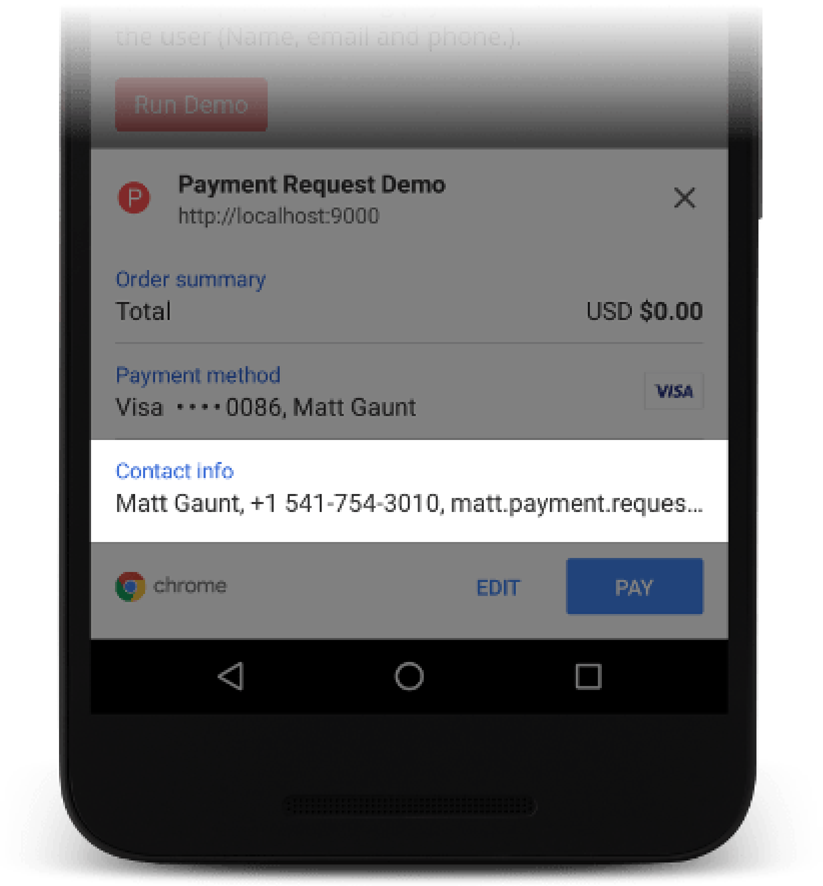
```
const options = {
  requestPayerName: true,
  requestPayerPhone: true,
  requestPayerEmail: true,
};
```

By default, all of these values are `false`, but returning `true` for any of them will result in an extra step in the UI.



Payment request UI requesting additional information from the user.

If the browser has these details available for the user, they'll be pre-populated.



Pre-populated user information.

The options object is also used to configure shipping, but we'll look at shipping in much more detail later on as it touches many parts of the API.

Edge Cases

The only edge case to note here is that if you define any of the parameters (`requestPayerName`, `requestPayerPhone` or `requestPayerEmail`) with a non-boolean value it will use the usual JavaScript truthy / falsy value (i.e., null, undefined, 0 will be treated as false and 'string value', {}, [] will be treated as true).

Responding to PaymentRequest.show()

After calling `show()` the payment request UI will be displayed to the user. Users will either close the UI or fill in the required fields and select 'Pay', at which point your app will need to "complete" the transaction.

You'll know if the user has successfully filled in the details as the promise returned by `show()` will resolve; if there was an issue or the user closed the UI the promise will reject.

```
paymentRequest.show()
.then((paymentResponse) => {
  // The user filled in the required fields and completed the flow
  // Get the details from `paymentResponse` and complete the transaction.
  return paymentResponse.complete();
})
.catch((err) => {
  // The API threw an error or the user closed the UI
});
```

Once the user has filled in the payment request UI, your web app will receive a `PaymentResponse` object in the `show()` promise.

It's this `paymentResponse` object that contains the user's payment information that you'll submit to your payment processor.

Accessing Details from the PaymentResponse

The `PaymentResponse` object contains the following parameters:

methodName	This is the payment method selected by the user. This will be one of the values passed into the `supportedMethods` objects ("basic-card" for example).
details	This is an object containing the payment details. The contents of this object will depend on the selected payment method. In the next paragraph we'll look at the contents of a basic card.
payerName	This will be null unless you set `requestPayerName` to true in the options object, in which case this will be a string of the payer's name.
payerPhone	This will be null unless you set `requestPayerPhone` to true in the options object, in which case this will be a string of the payer's phone number.
payerEmail	This will be null unless you set `requestPayerEmail` to true in the options object, in which case this will be a string of the payer's email address.
*** Shipping Info**	We will cover this in the shipping section.

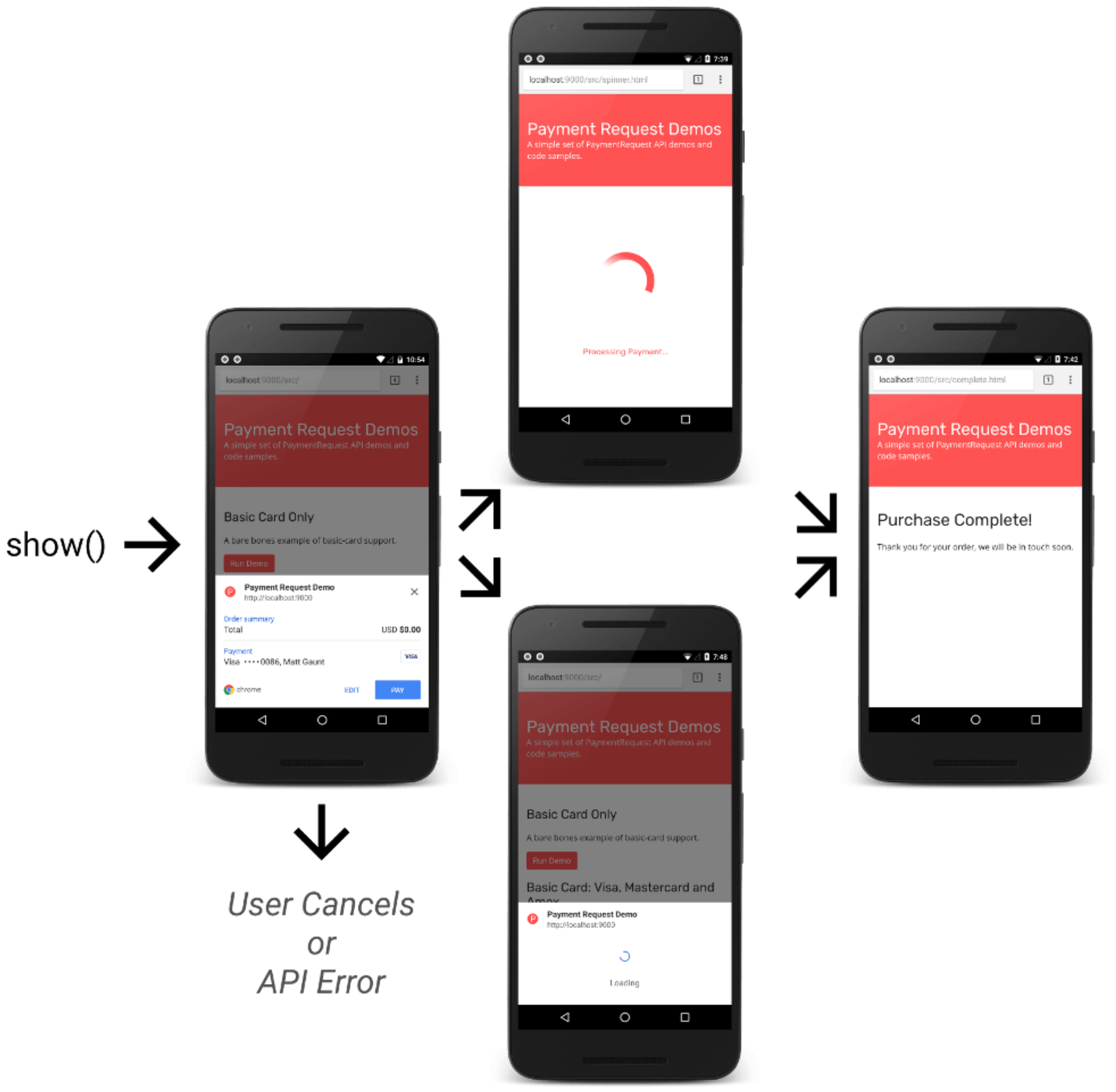
The details object is only standardized for the basic-card payment method. For third party payment methods, like Google Pay, the details object's content will be documented by the payment method.

For 'basic-card' payments, the details object will contain the `billingAddress`, `cardNumber`, `cardSecurityCode`, `cardholderName`, `expiryMonth`, and `expiryYear`.

Once you have these details from the `PaymentResponse`, you need to process the payment and "complete" the transaction by calling the `paymentResponse.complete()` method.

Completing the Transaction

After the promise from `show()` has resolved, the payment request UI will display a loading UI to the user. You can either leave this spinner visible while you process the payment details or you can close the UI immediately and validate the payment details in your own UI.



Possible flows after the show() promise has resolved.

If you wanted to close the payment request UI immediately, you would call the **`PaymentResponse.complete()`** method.

```
paymentRequest.show()
.then((paymentResponse) => {
  // Close the payment request UI.
  return paymentResponse.complete()
  .then(() => {
    // TODO: Get the payment details from paymentResponse object.
    // TODO: Process payment
  });
})
.catch((err) => {
  console.error('Payment Request API error: ', err);
});
```

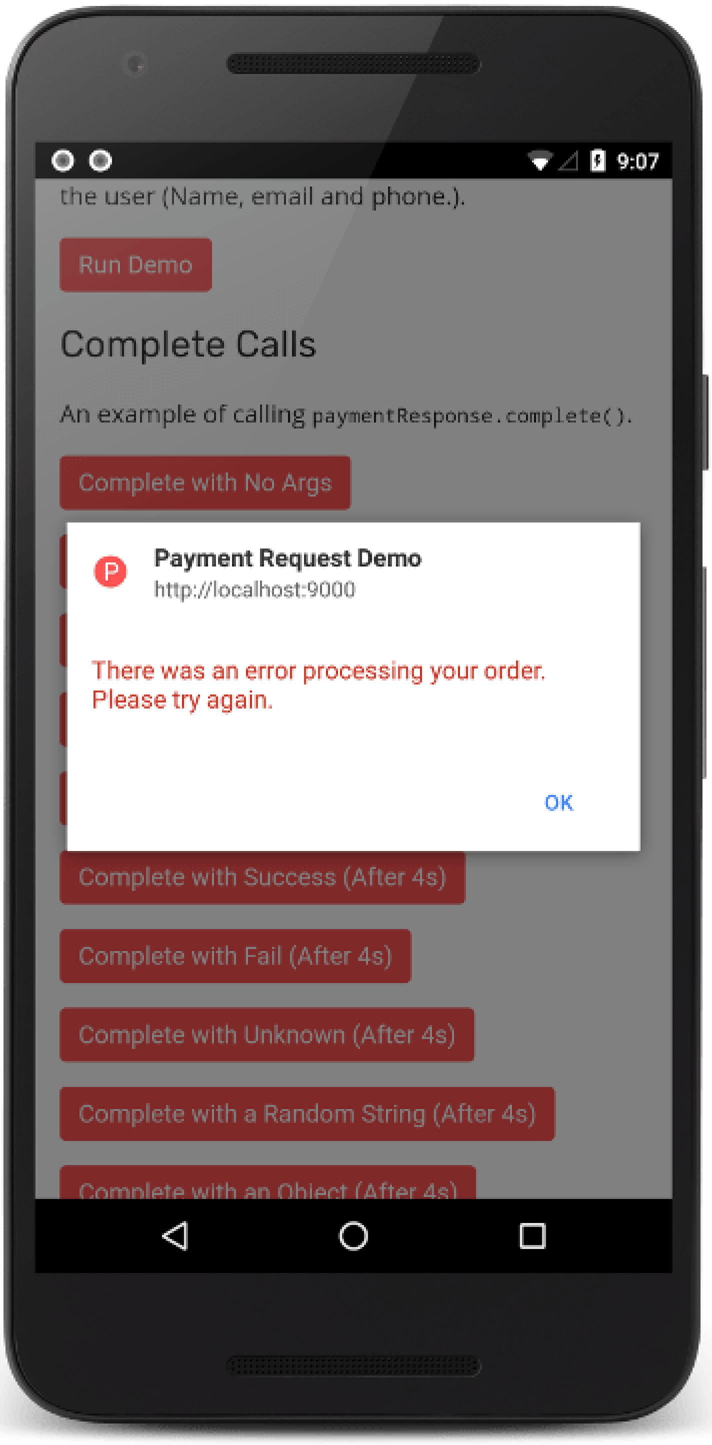
This will close the payment request UI and you can do whatever you want to process the user's payment information. Calling the **`complete()`** method without any arguments like this, is equivalent to calling **`paymentResponse.complete('unknown')`**. You are telling the browser to not treat the payment as a success or failure and to show no UI or animations to suggest otherwise to the user.

If you wanted to process the payment while the payment request UI is showing a spinner you'd delay the call to **`complete()`**. Let's assume we have a method called **`validatePaymentWithBackend()`** that will check the details with our backend and return a promise resolving to a boolean (true if the payment was successful, false otherwise). We'd keep the spinner up and call **`complete()`** after this method has resolved, like so:

```
paymentRequest.show()
.then((paymentResponse) => {
  return validatePaymentWithBackend(paymentResponse)
  .then((success) => {
    if (success) {
      return paymentResponse.complete('success');
    } else {
      return paymentResponse.complete('fail');
    }
  });
})
.catch((err) => {
  // The API threw an error or the user closed the UI
});
```

In this example we are using the 'success' and 'fail' strings to highlight to the browser the states of the transaction. If you include these strings the browser may show a visual indication to the user suggesting a positive or negative outcome.

At the time of writing, Chrome will just hide the UI on success but will show an error dialog to the user if you call with `complete('fail')` .


the user (Name, email and phone.).

Run Demo

Complete Calls

An example of calling `paymentResponse.complete()`.

Complete with No Args

Payment Request Demo
http://localhost:9000

There was an error processing your order.
Please try again.

OK

Complete with Success (After 4s)

Complete with Fail (After 4s)

Complete with Unknown (After 4s)

Complete with a Random String (After 4s)

Complete with an Object (After 4s)

Example of the error dialog shown when calling complete with fail input.

Edge Cases

Completing with a Diff String One possible gotcha with the `complete()`` method is that if you pass in a string that is not defined by the spec (i.e., the string is not 'unknown', 'success,' or 'fail'), the promise returned by complete() will reject and the payment request UI **will not close** (this behavior will hopefully change soon). The error in the rejected promise will be:

```
Failed to execute 'complete' on 'PaymentResponse': The provided value '...' is
not a valid enum value of type PaymentComplete.
```

Not Calling Complete If you fail to call complete() in a timely manner, it will time out and the UI will be closed. The browser will show a message to the user highlighting there was an issue.

Shipping in Payment Request API

When you are selling physical goods you'll need to collect shipping information from your users.

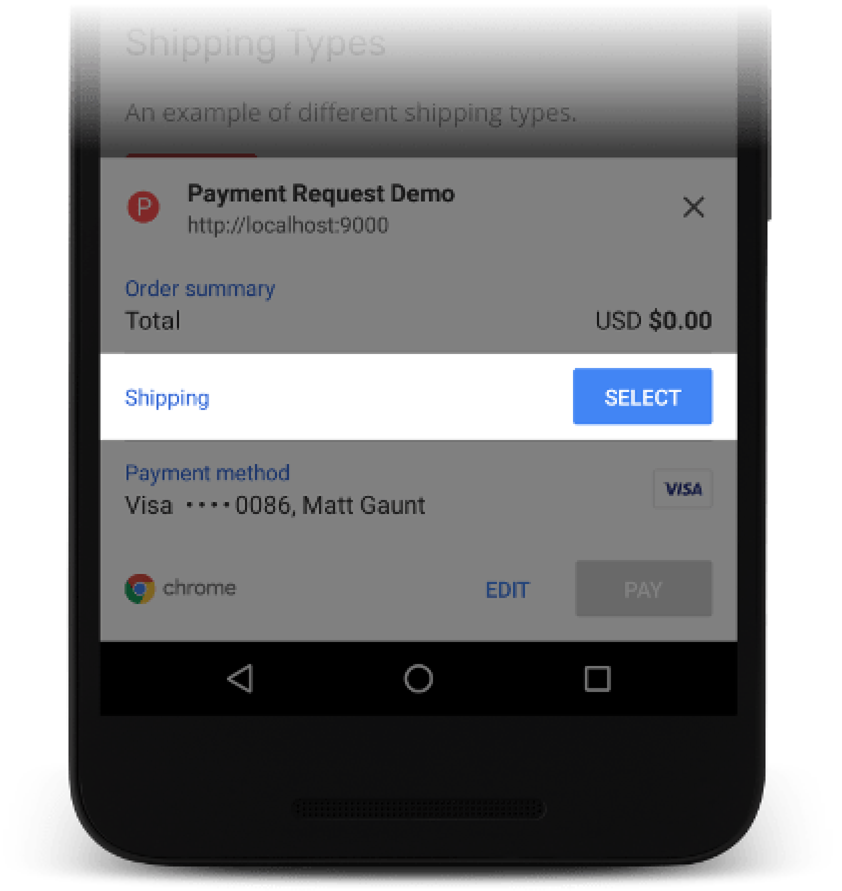
In this section we'll look at how you can request shipping information from the user, define the type of shipping, and react to changes to the shipping address and shipping option from the user.

Request Shipping Details

To start off with, you'll need to request shipping information from the user, which is achieved by setting `requestShipping` to `true` in the `options` object.

```
const options = {
  requestShipping: true,
};
```

This will ask the user for their shipping address:



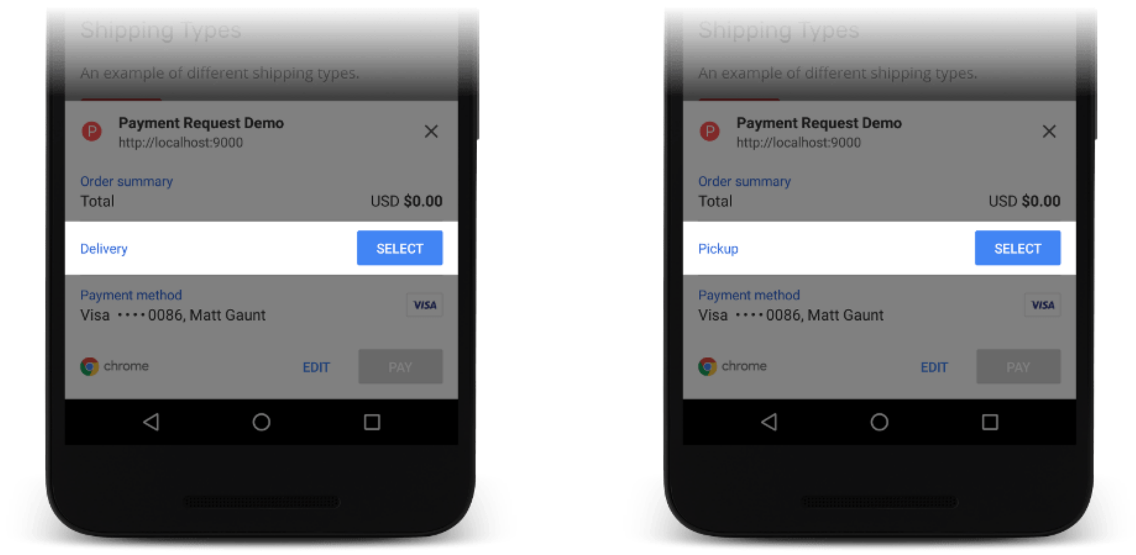
Request shipping information from the user.

By default the Payment Request API will set a shippingType to 'shipping'. This is why the title on the highlighted row above is "Shipping".

Changing the Shipping Type

There are situations where the term "Shipping" isn't appropriate given the current context, even though an address is required from the user. For example, a food delivery service needs a **delivery address** and a laundry service may need a **pickup address**.

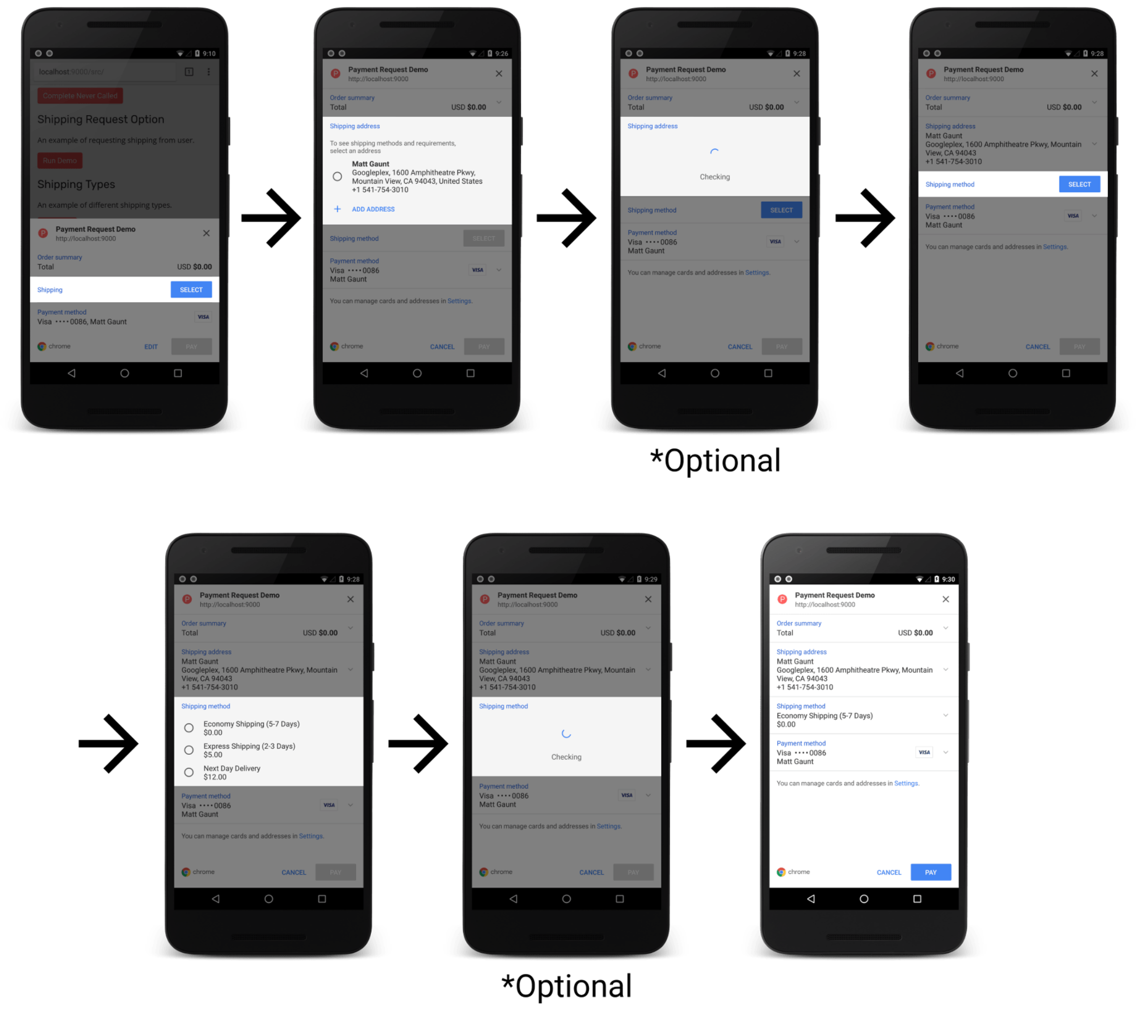
To serve these use cases, you can define a `shippingType` of "shipping", "delivery", or "pickup" to change the UI's title to "Shipping", "Delivery" and "Pickup".



Examples of delivery and pickup shipping labels.

The spec defines these types fairly well if you need further clarification.

There is a small lifecycle that the user will go through when selecting a shipping address.



Lifecycle of shipping address selection.

The flow is:

1. The user selects the address input.
2. The user picks a predefined address or adds a new one.
3. Your app has the opportunity of validating the address details and defining shipping options based on the selection.
4. The shipping options field will be enabled.
5. The user will be given the options you've defined.
6. Your app will have the option to validate the selection.
7. The user will be able to continue with the rest of the flow.

We'll start by looking at the `shppingAddressChange` event which is dispatched as the user selects a new address.

Handling Shipping Address Changes

If you've requested shipping information from the user, a **`shippingAddressChange`** event will be dispatched whenever the user changes the shipping address. This gives you an opportunity to check that the address meets any requirements you might have (e.g. you may not ship to specific countries) and it provides an opportunity to determine what the available shipping options are.

At the time of writing, you are required to add a **`shippingaddresschange`** event listener in Chrome (although this behavior is likely to change to be optional).

You can listen for the event like so:

```
const paymentRequest = new PaymentRequest(
    supportedPaymentMethods, paymentDetails, options);

paymentRequest.addEventListener('shippingaddresschange', (event) => {
  // TODO: Handle the event
});

paymentRequest.show()
.then(...)
.catch(...)
```

We are simply adding the event listener to our **`PaymentRequest`** instance before calling **`show()`**. When this event is triggered, the common pattern will be to check the user's selected address and then provide the available shipping options.

Retrieving the shippingAddress

When a **`shippingAddressChange`** event has been dispatched, the selected address will be added to the current **`PaymentRequest`** instance under the **`shippingAddress`** parameter.

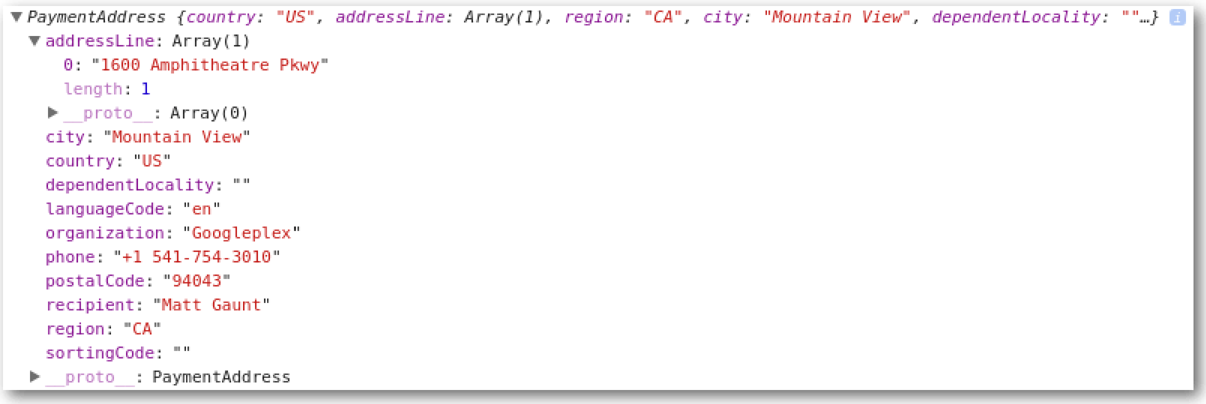
To give an example, we can print the shipping address to the console like so:

```
const paymentRequest = new PaymentRequest(...);
paymentRequest.addEventListener('shippingaddresschange', (event) => {
  console.log(paymentRequest.shippingAddress);
  ...
});
```

Alternatively, you can use **`event.target`** to access the **`PaymentRequest`** instance.

```
const paymentRequest = new PaymentRequest(...);
paymentRequest.addEventListener('shippingaddresschange', (event) => {
    const prInstance = event.target;
    console.log(prInstance.shippingAddress);
    ...
});
```

In the console we'd see this:



```
▼ PaymentAddress {country: "US", addressLine: Array(1), region: "CA", city: "Mountain View", dependentLocality: ""…}
  ▼ addressLine: Array(1)
      0: "1600 Amphitheatre Pkwy"
      length: 1
    ▶ __proto__: Array(0)
    city: "Mountain View"
    country: "US"
    dependentLocality: ""
    languageCode: "en"
    organization: "Googleplex"
    phone: "+1 541-754-3010"
    postalCode: "94043"
    recipient: "Matt Gaunt"
    region: "CA"
    sortingCode: ""
  ▶ __proto__: PaymentAddress
```

The details we can retrieve from the shipping address parameter.

The `shippingAddress` will have the following *readonly* parameters:

recipient	*String* This is the name of the recipient or contact person. This member may, under certain circumstances, contain multiline information. For example, it might contain "care of" information.
organization	*String* This is the organization, firm, company, or institution at this address.
addressLine	*Array of string* This is the most specific part of the address. It can include, for example, a street name, a house number, apartment number, a rural delivery route, descriptive instructions, or a post office box number.
city	*String* This is the city/town portion of the address.
region	*String* This is the top level administrative subdivision of the country. For example, this can be a state, a province, an oblast, or a prefecture.
country	*String* This is the [CLDR] (Common Locale Data Repository) region code. For example, US, GB, CN, or JP.

postalCode	*String* This is the postal code or ZIP code, also known as PIN code in India.
phone	*String* This is the phone number of the recipient or contact person.
languageCode	*String* This is the BCP-47 language code for the address. It's used to determine the field separators and the order of fields when formatting the address for display.
sortingCode	*String* This is the sorting code as used in, for example, France.
dependentLocality	*String* This is the dependent locality or sublocality within a city. For example, used for neighborhoods, boroughs, districts, or UK dependent localities.

This should be everything you need to get the user's selected shipping address but it does raise the question, how do you tell the Payment Request API what the available shipping options are?

Defining the Available Shipping Options

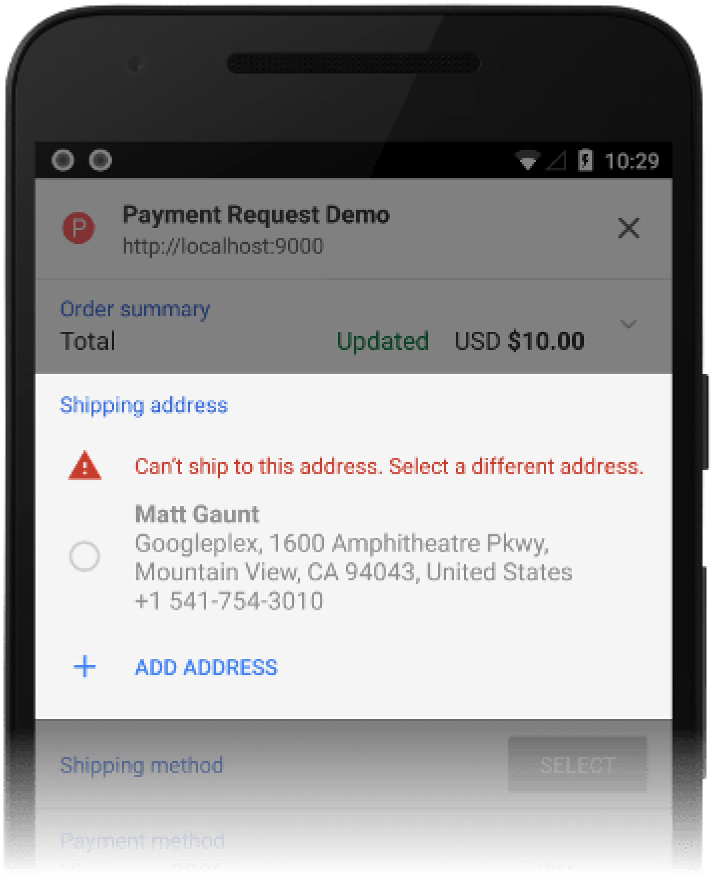
The event object you'll receive in the `shippingaddresschange` event is a `PaymentRequestUpdateEvent` which has a method `updateWith()`. You must call this method with a `paymentDetails` object (i.e. an object with a `total` and optional `displayItems`) or call it with a `Promise` that resolves to a `paymentDetails` object.

The important difference when passing in a `paymentDetails` object to `event.updateWith()` compared to passing it to the constructor, is that we **must** include `shippingOptions`, which will be the array of objects defining what the user can select.

For a simple example, we can call `event.updateWith()` with payment details of a `total` and an empty array for `shippingOptions`:

```
paymentRequest.addEventListener('shippingaddresschange', (event) => {
  const paymentDetails = {
    total: {
      label: 'Total',
      amount: {
        currency: 'USD',
        value: 10,
      },
    },
    shippingOptions: [],
  };
  event.updateWith(paymentDetails);
});
```

Returning no shipping options tells the browser that the selected shipping address is not suitable or supported by your site, so browsers will display an error to the user:



Returning no shipping options displays an error to users.

This happens because the API expects at least one shipping option to be available for the user to select. Before we look at how to actually define the shipping options, it's worth covering how you can customize the error message.

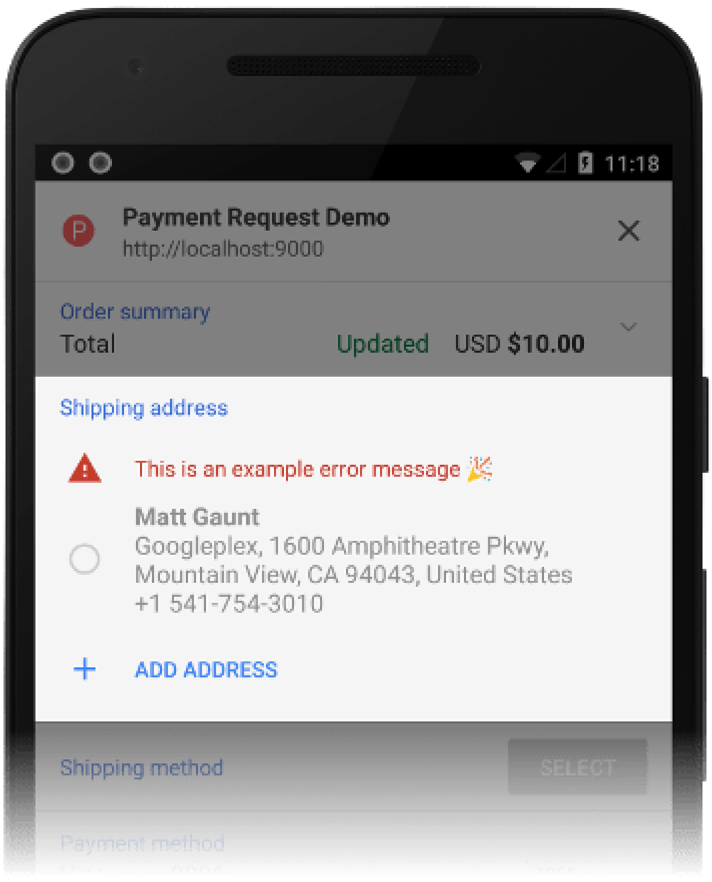
Customizing the Shipping Options Error

If you can't ship to a user's selected address, you should provide a meaningful message to them. Adding an `error` parameter to the transaction details you return to `event.updateWith()` will achieve this.

For example, we can set a custom message with:

```
paymentRequest.addEventListener('shippingaddresschange', (event) => {
  const paymentDetails = {
    total: {
      label: 'Total',
      amount: {
        currency: 'USD',
        value: 10,
      },
    },
    error: 'This is an example error message 🎉',
    shippingOptions: [],
  };
  event.updateWith(paymentDetails);
});
```

Which will display to the user as:


11:18
Payment Request Demo
http://localhost:9000
Order summary
Total Updated USD $10.00
Shipping address
This is an example error message 🎉
Matt Gaunt
Googleplex, 1600 Amphitheatre Pkwy,
Mountain View, CA 94043, United States
+1 541-754-3010
ADD ADDRESS
Shipping method SELECT
Payment method

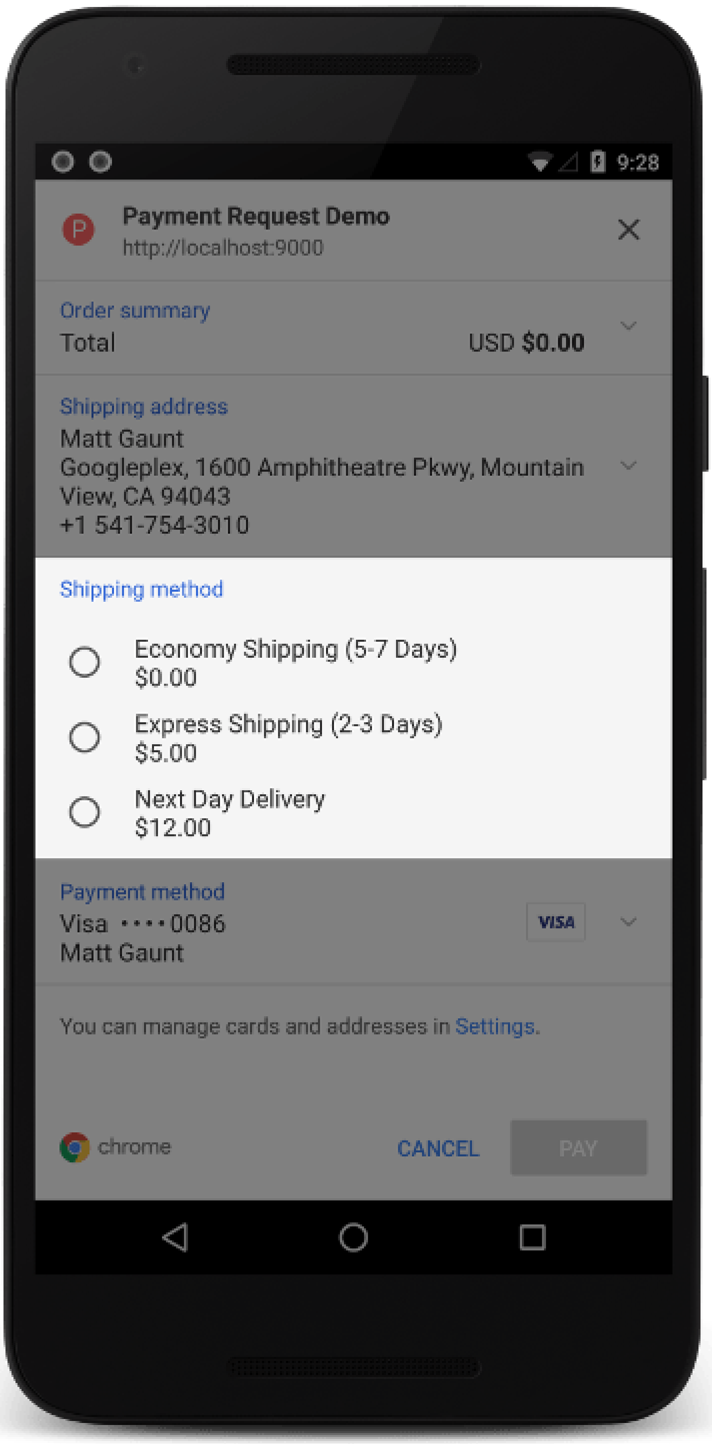
Example of a custom error when returning no shipping options.

Defining Shipping Options

Where there are available shipping options, you can define the available options by setting the **`shippingOptions`** to an array of objects containing an **`id`**, **`label`**, and **`amount`** with **`currency`** and **`value`**, like so:

```
paymentRequest.addEventListener('shippingaddresschange', (event) => {
  const paymentRequest = event.target;
  console.log(paymentRequest.shippingAddress);

  event.updateWith({
    total: {
      label: 'Total',
      amount: {
        currency: 'USD',
        value: '0',
      },
    },
    shippingOptions: [
      {
        id: 'economy',
        label: 'Economy Shipping (5-7 Days)',
        amount: {
          currency: 'USD',
          value: '0',
        },
      }, {
        id: 'express',
        label: 'Express Shipping (2-3 Days)',
        amount: {
          currency: 'USD',
          value: '5',
        },
      }, {
        id: 'next-day',
        label: 'Next Day Delivery',
        amount: {
          currency: 'USD',
          value: '12',
        },
      },
    ],
  });
});
```

This will give the user a set of options to select under the "Shipping Method" title.



9:28

Payment Request Demo
http://localhost:9000

Order summary
Total USD **$0.00**

Shipping address
Matt Gaunt
Googleplex, 1600 Amphitheatre Pkwy, Mountain View, CA 94043
+1 541-754-3010

Shipping method

- ○ Economy Shipping (5-7 Days) $0.00
- ○ Express Shipping (2-3 Days) $5.00
- ○ Next Day Delivery $12.00

Payment method
Visa ••••0086
Matt Gaunt

You can manage cards and addresses in Settings.

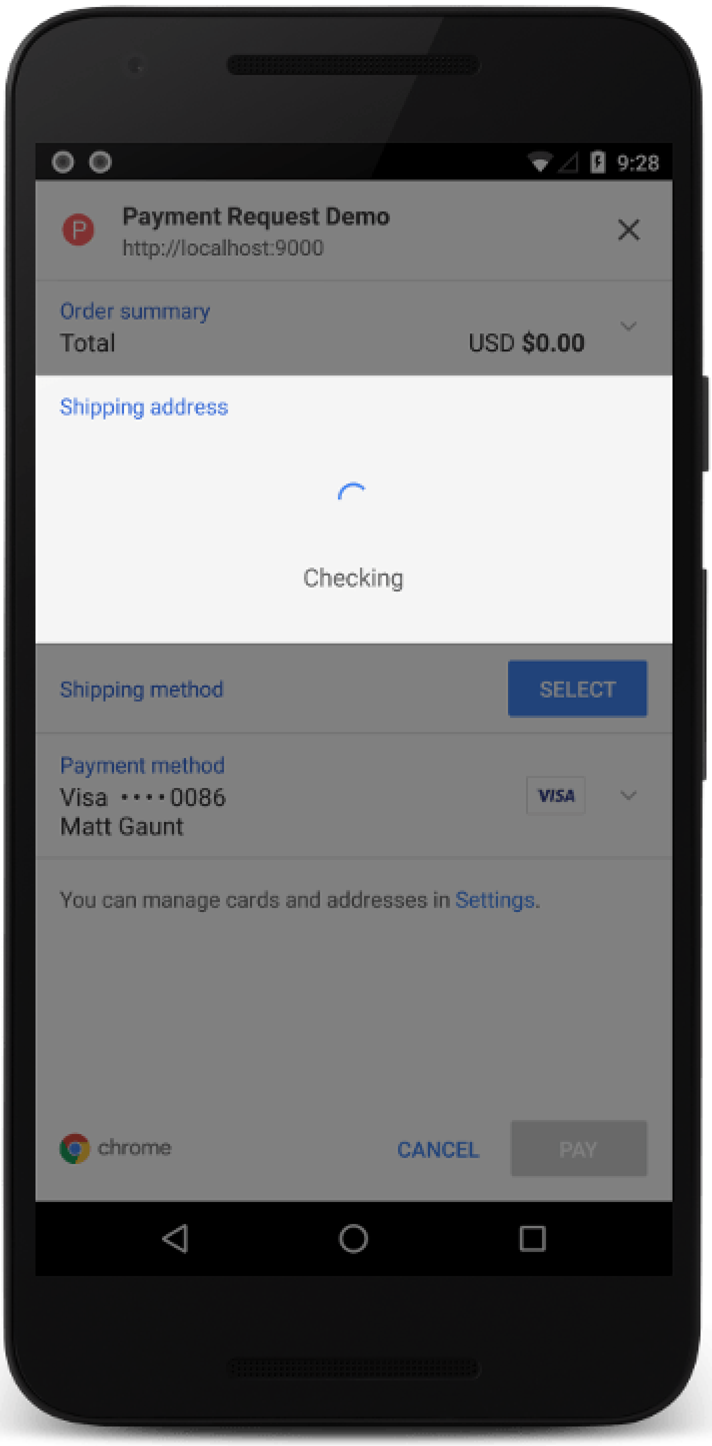
How shipping options are displayed to the user.

In the above examples, we are calling `event.updateWith()` directly with our `paymentDetails` containing the `total` and `shippingOptions`. If we do this, the user will not see a loading spinner and can continue with the rest of the checkout flow.

If you need time to retrieve available shipping options from your backend, you can pass a `Promise` to `event.updateWith()`. In the following example we are making an API call and setting the shipping options based on the response:

```
paymentRequest.addEventListener('shippingaddresschange', (event) => {
  const paymentRequest = event.target;
  console.log(paymentRequest.shippingAddress);

  const shippingAddrCheckPromise = fetch('/api/get-shipping-opts/', {
    method: 'POST',
    credentials: 'include',
     headers: {
       'Content-Type': 'application/json'
     },
    body: JSON.stringify(paymentRequest.shippingAddress),
  })
  .then((response) => {
    return response.json();
  })
  .then((responseData) => {
    return {
      total: {
        label: 'Total',
        amount: {
          currency: 'USD',
          value: '0',
        },
      },
      shippingOptions: responseData.shippingOptions,
    };
  });

  event.updateWith(shippingAddrCheckPromise);
});
```

While the network request is being made, the user will see a spinner:



A spinner is shown if you return a Promise to event.updateWith().

Edge Cases

Never Calling updateWith() or Long Promise If you fail to call `event.updateWith()` or pass it a promise that fails to resolve in a timely manner, the UI will close itself and the show promise will reject with the following error:

```
DOMException: Timed out as the page didn't resolve the promise from change event
```

Using an Invalid Shipping Type If you set the `shippingType` to an invalid value (i.e., something other than 'shipping', 'delivery' or 'pickup'), you'll receive the following error:

```
The provided value '...' is not a valid enum value of type PaymentShippingType.
```

Shipping Options with a Non-Unique ID If the returned shipping options do not have unique IDs the Payment Request API will treat this as though the address is invalid. In other words, it's the equivalent of setting the `shippingOptions` to an empty array, which shows the "Can't ship to this address. Select a different address." message.

Missing Information from a Shipping Option If any of the shipping options are missing a required parameter then the promise returned by `show()` will reject with an error highlighting the missing parameter. Please note that it does not highlight where the value is missing (i.e., the error message may be referring to a problem in the `total`, `displayItems`, or `shippingOptions` parameters).

```
// Shipping option missing an id parameter
DOMException: required member id is undefined.

// Shipping option missing a label parameter
DOMException: required member label is undefined.

// Shipping option missing an amount parameter
DOMException: required member amount is undefined.

// Shipping option missing an amount.currency parameter
DOMException: required member currency is undefined.

// Shipping option missing an amount.value parameter
DOMException: required member value is undefined.
```

Handling Shipping Options Changes

Just as you can listen for changes to the shipping address, you can listen for changes to the selected shipping option. The tasks to perform here are to mark the shipping option as `selected` if it's valid and update the total and display items.

We add a listener for **`shippingoptionchange`** events to our **`PaymentRequest`** instance same as **`shippingaddresschange`**.

```
paymentRequest.addEventListener('shippingoptionchange', (event) => {
  // TODO: Select a shipping option,  update total and display items.
});
```

At the time of writing, you are required to add a `shippingoptionchange` event listener in Chrome (although this behavior is likely to change to be optional).

In many ways this event is similar to the **`shippingaddresschange`** event.

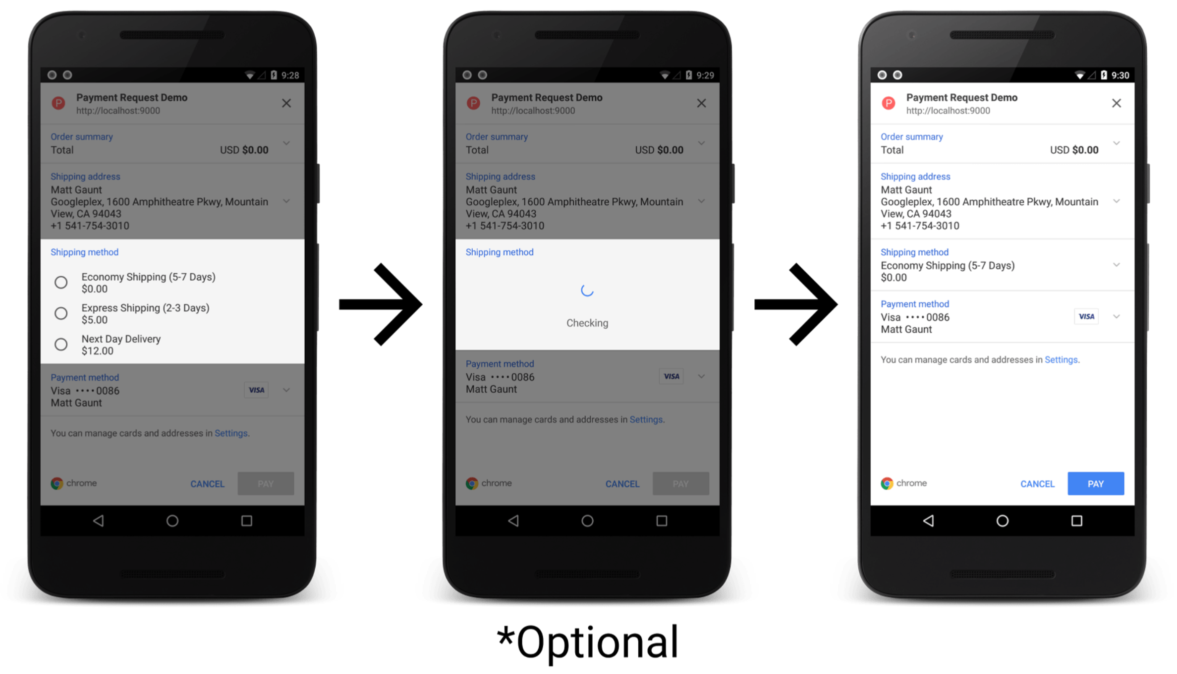
- It expects a **`paymentDetails`** object with a **`total`**, **`displayItems`**, and **`shippingoptions`** to be passed into **`event.updateWith()`** (or a Promise that resolves to this object).
- Updating with an empty array for **`shippingoptions`** is treated as an error and treats the address as unsupported.
- Updating with an empty array for **`shippingoptions`** and adding a string to an **`error`** parameter will display the custom error message to the user.

The one thing you must do is mark the selected shipping option as **`selected`**. To do this we'll take the following steps:

1. Get the **`PaymentRequest`** object from the event.
2. Get the selected shipping option from the **`PaymentRequest`** object.
3. Set **`selected`** to true on this shipping option before calling **`event.updateWith()`**.

```
paymentRequest.addEventListener('shippingoptionchange', (event) => {
  // Step 1: Get the payment request object.
  const prInstance = event.target;

  // Step 2: Get the ID of the selected shipping option.
  const selectedId = prInstance.shippingOption;

  // Step 3: Mark selected option
  globalShippingOptions.forEach((option) => {
    option.selected = option.id === selectedId;
  });

  // TODO: Update total and display items, including pending states.

  event.updateWith({
    total: {
      label: 'Total',
      amount: {
        currency: 'USD',
        value: '0',
      },
    },
    shippingOptions: globalShippingOptions,
  });
});
```

Doing this will update the UI as the user selects a new shipping option. If you return a promise to **`updateWith()`**, the user will also be presented with a spinner until it resolves.



The lifecycle of shipping option selection.

Edge Cases

All of the edge cases from the **`shippingaddresschange`** event apply to **`shippingoptionschange`** event. There are a few additional edge cases to be aware of.

Failing to Mark an Option as Selected One footgun to be aware of is that if you fail to mark a shipping option as **`selected`**, you will end up in a scenario where the user will be stuck in a loop without any reason as to why they can't select an option. They can go through the flow to select a shipping option, the event is triggered and if nothing is marked as selected, they'll be taken back to the payment request UI and have to select a shipping method again.

Selecting Multiple Options If you set the selected parameter to `true` on *multiple shipping options*, the last entry will be selected.

Variants to Above Flow

In the above flow, we took the user through the following steps:

1. The user selects an address.
2. The app validates the address / provides some shipping options.
3. The user selects a shipping option.
4. The app updates the total and display items.
5. The user completes the transaction.

You can shorten this flow for the user by specifying data at different stages. In this section we'll see what we can change.

Defining Shipping Options Up Front

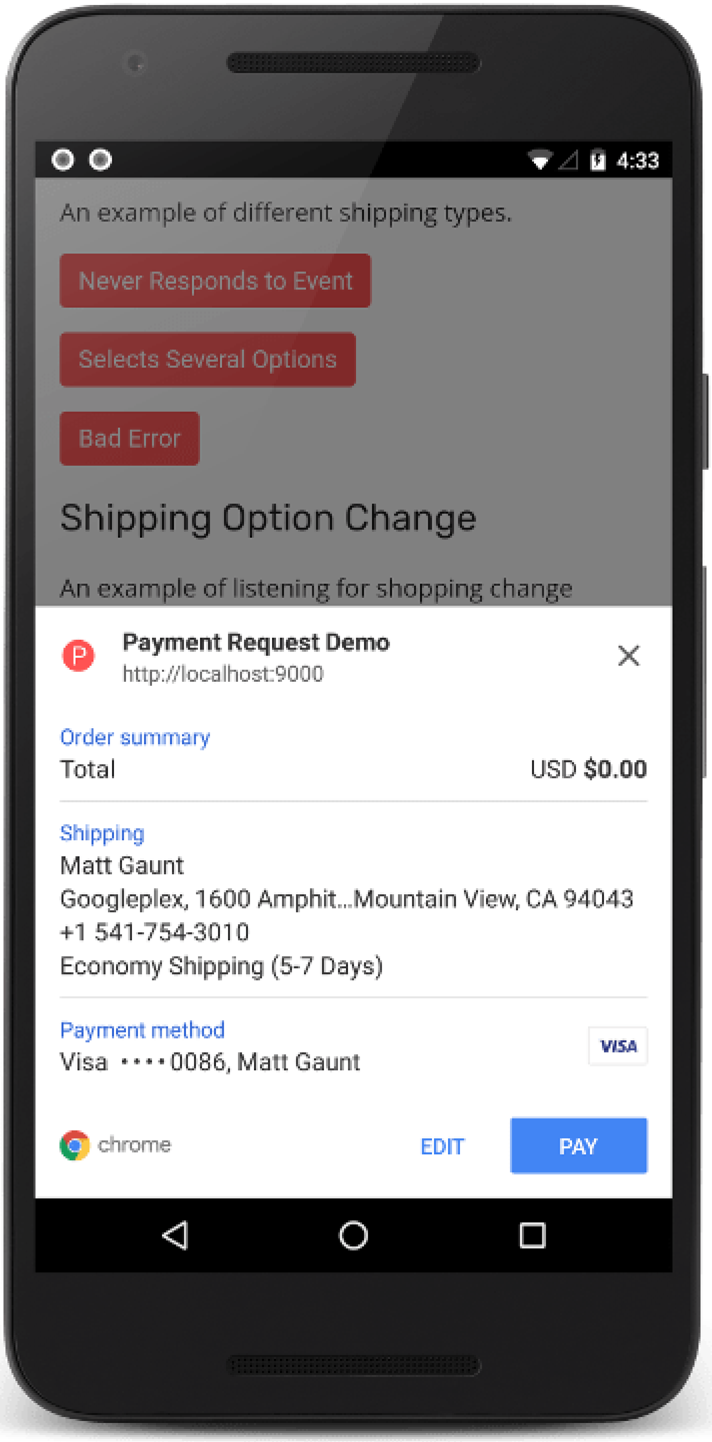
In the `PaymentRequest` constructor, we can define `shippingOptions` as part of the initial `paymentDetails` object (i.e. we don't have to wait until a `shippingaddresschange` event):

```
const paymentDetails = {
  total: {
    label: 'Total',
    amount: {
      currency: 'USD',
      value: '0',
    },
  },
  shippingOptions: [
    {
      id: 'economy',
      label: 'Economy Shipping (5-7 Days)',
      amount: {
        currency: 'USD',
        value: '0',
      },
    },
  ],
};
new PaymentRequest(paymentMethods, paymentDetails, options);
```

If we do this, there is no difference to the flow we discussed before. The user will still need to select an address and then shipping options. **However**, if you mark one of the shipping options as selected in this initial object, the browser may pre-select an address. For example, if we construct our payment request UI with the following input (Note the `selected` parameter):

```
const paymentDetails = {
  total: {
    label: 'Total',
    amount: {
      currency: 'USD',
      value: '0',
    },
  },
  shippingOptions: [
    {
      id: 'economy',
      label: 'Economy Shipping (5-7 Days)',
      selected: true,
      amount: {
        currency: 'USD',
        value: '0',
      },
    },
  ],
};
new PaymentRequest(paymentMethods, paymentDetails, options);
```

The user will be presented with a UI where an address and shipping has been selected.



4:33

An example of different shipping types.

Never Responds to Event

Selects Several Options

Bad Error

Shipping Option Change

An example of listening for shopping change

Payment Request Demo
http://localhost:9000

Order summary
Total USD **$0.00**

Shipping
Matt Gaunt
Googleplex, 1600 Amphit...Mountain View, CA 94043
+1 541-754-3010
Economy Shipping (5-7 Days)

Payment method
Visa ••••0086, Matt Gaunt

An example of preselecting a shipping option in the PaymentRequest constructor.

This has the advantage that the user can click the 'Pay' button immediately and complete the transaction with one click. The downside is that you won't receive a **`shippingaddresschange`** event, meaning that you can't validate the address details.

Only select a shipping option in the constructor like this **if you are extremely confident** that the selected option won't need to change based on the user's address (e.g. you offer worldwide free shipping).

Select a Shipping Option in shippingaddresschange

In the **`shippingaddresschange`** event we saw that whichever shipping options we passed to **`event.updateWith()`** would be made available to the user.

Setting one of the options' **`selected`** parameter to true will select that option, allowing the user to progress through the checkout flow quicker. This is perfect if you know the most common shipping option.

```
paymentRequest.addEventListener('shippingaddresschange', (event) => {
  const paymentRequest = event.target;
  console.log(paymentRequest.shippingAddress);

  event.updateWith({
    total: {
      label: 'Total',
      amount: {
        currency: 'USD',
        value: '0',
      },
    },
    shippingOptions: [
      {
        id: 'economy',
        label: 'Economy Shipping (5-7 Days)',
        selected: true,
        amount: {
          currency: 'USD',
          value: '0',
        },
      }, {
        id: 'express',
        label: 'Express Shipping (2-3 Days)',
        amount: {
          currency: 'USD',
          value: '5',
        },
      }, {
        id: 'next-day',
        label: 'Next Day Delivery',
        amount: {
          currency: 'USD',
          value: '12',
        },
      },
    ],
  });
});
```

Abort a Transaction

The `abort()` method can be used when the shopping session has timed out or an item in the cart sells out during the transaction and you need to close the payment request UI.

For a simple example:

```
paymentRequest.show()
.catch((err) => {
  console.error('PaymentRequest error: ', err);
});

setTimeout(() => {
  paymentRequest.abort()
  .then(() => {
    // Successfully aborted payment request
    // TODO: Display message to user.
  })
  .catch((err) => {
    // Unable to abort payment request
    console.log('abort() Error: ', err);
  });
}, 4000);
```

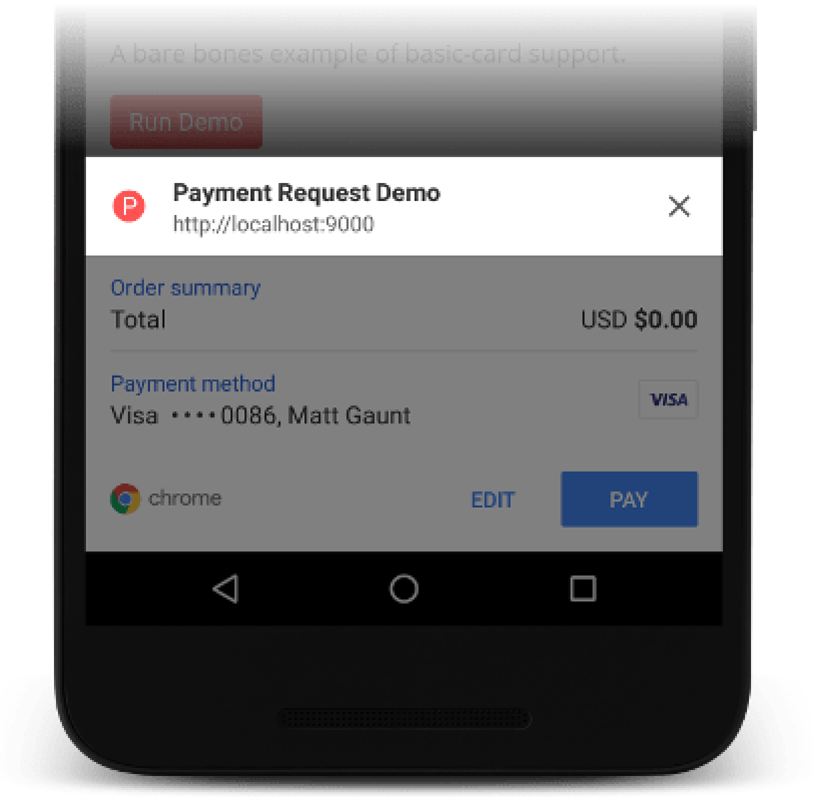
In the above example, if we leave the payment request dialog visible, the `show()` promise will reject with the following error:

`DOMException: The user aborted a request.`

The promise returned by `abort()` allows you to detect whether the abort was successful or not. An example of where it might fail is if the user cancels the payment request UI or completes the transaction before you call `abort()`, although it can fail to abort when the developer is in the middle of entering details.

The Payment Request UI

One aspect of the UI hasn't been discussed. How is the top section of the payment request UI is constructed?



The generated piece of the payment request UI.

This UI is a combination of information readily available from the page.

The icon on the left is the most appropriately sized icon the browser can find.

You can define multiple icon sizes in the head of your document like so:

```
<link rel="icon" href="images/icon-512x512.png" sizes="512x512" type="image
```

The text in bold, "Payment Request Demo", is taken from the title of the current page (i.e., **`<title>Payment Request Demo</title>`**).

The URL that is displayed is the current origin.

Check Payment Method Availability

Before calling `paymentRequest.show()` you might want to know if the user already has an available payment method set-up (i.e. will the payment request UI have a preselected payment method or not).

The `canMakePayment()` method tells you whether the user has a payment method that fulfills the current `PaymentRequest`'s supported payment methods.

```
const paymentRequest = new PaymentRequest(
    supportedPaymentMethods, transactionDetails, options);

// If canMakePayment() isn't available, default to assume the method is supported
const canMakePaymentPromise = Promise.resolve(true);

// Feature detect canMakePayment()
if (request.canMakePayment) {
  canMakePaymentPromise = paymentRequest.canMakePayment();
}

canMakePaymentPromise.then((result) => {
  if (!result) {
    // The user does not have a supported payment method.
    // TODO: Redirect to traditional checkout flow.
    return;
  }

  // TODO: The user has a payment - call show().
})
.catch((err) => {
  // TODO: Either fallback to traditional checkout or call show().
});
```

Edge Cases

Query Quota Exceeded Querying `canMakePayment()` with different payment methods will result in a quota error:

`DOMException: Query quota exceeded`

The reason this error is thrown is to block attempts to fingerprint the user.

At the time of writing, Chrome will reset the quota after 30 minutes or when it's restarted.

Will it Ever Fail for Basic-Cards? Basic cards are a standardized payment method of the Payment Request API, so is there every a scenario where `canMakePayment()` will fail?

It can fail if the user has no known cards or the known cards are invalid (i.e. the details for the card don't pass the LUHN check).

How does canMakePayment() Work with Payment Apps? If a site indicates support for URL payment method, like 'https://example.com/bobpay', `canMakePayment()` will return "false" if the app is not installed. When the app is installed, it can decide if `canMakePayment()` should return true or false.

Note: In incognito mode, the 3rd party app will not be queried and `canMakePayment()` will always return "true".

PaymentRequest Shim

To mitigate the pains of catching up with this living standard API, we strongly recommend you add this shim to the **<head>** of your page. This shim will be updated as the API changes and will do its best to keep your code working for at least 2 major releases of Chrome.

We also provide a PaymentRequest wrapper for Apple Pay JS.