📚 Locator-X Technical Documentation

*Developer reference for architecture, codebase, workflows, and extension internals*

🧭 Overview

**Locator-X** is a Chrome extension built with Manifest V3. It enables real-time generation, evaluation, and management of web element locators across complex DOM structures, including shadow DOM and iframes. It supports multiple locator formats and includes a sidepanel UI for interaction.

📁 File & Folder Structure

| **Path** | **Description** |
| --- | --- |
| manifest.json | Extension metadata, permissions, entry points |
| package.json | Project metadata and developer scripts |
| icons/ | Toolbar and extension icons |
| src/background.js | Handles keyboard shortcuts, tab events, and messaging |
| src/content.js | Injected into pages; generates locators and highlights elements |
| src/content-iframe.js | Injected into iframes; enables locator generation inside them |
| src/locator-evaluator.js | Evaluates locators across all frames |
| src/sidepanel.html | Sidepanel UI layout |
| src/sidepanel.js | Sidepanel logic, messaging, UI updates |
| src/highlight.css | Highlight styles for matched elements |
| src/style.css | Main sidepanel styling |
| src/compact.css | Optional compact UI overrides |

🧩 Manifest V3 Concepts

* manifest\_version: 3: Required for service worker architecture
* permissions:
  + activeTab: Access current tab
  + scripting: Inject scripts
  + storage: Save locators and preferences
  + sidePanel: Use Chrome’s sidepanel API
* host\_permissions: for universal access
* background.service\_worker: Loads background.js
* content\_scripts: Injects content.js into supported pages
* web\_accessible\_resources: Allows dynamic injection of CSS and JS

🔧 Core Modules

background.js

* Listens for Ctrl+Shift+X via chrome.commands.onCommand
* Opens sidepanel on icon click
* Sends tab change/update messages to sidepanel
* Handles sidepanel close events and disables capture mode
* Uses fallback port disconnect detection

content.js

* Generates locators (ID, Name, CSS, XPath, Playwright, JSPath, jQuery)
* Supports shadow DOM and iframe traversal
* Highlights matched elements with depth-based colors
* Sends locator data to sidepanel
* Handles hover/click events
* Evaluates locator match count
* Suggests locators based on fuzzy matching

content-iframe.js

* Injected into iframes
* Detects iframe elements via MutationObserver
* Prefixes locators with iframeSelector >>> elementSelector
* Handles cross-origin iframe detection
* Injects highlight styles and messaging logic

locator-evaluator.js

* Evaluates locators across all frames using:

chrome.webNavigation.getAllFrames({ tabId }, callback)

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* Aggregates match counts and updates UI

🧠 Locator Types Supported

| **Type** | **Syntax** | **Shadow DOM** | **Iframe** |
| --- | --- | --- | --- |
| ID | #elementId | ✅ | ✅ |
| Name | [name="email"] | ✅ | ✅ |
| CSS | div.container > span | ✅ | ✅ |
| XPath | //input[@id='email'] | ❌ | ✅ |
| Playwright | text="Login" | ✅ | ✅ |
| JSPath | document.querySelector("#email") | ❌ | ✅ |
| jQuery | div:contains("Login") | ✅ | ✅ |

🧪 Evaluation Logic

* getMatchCount(locator, type) returns match count
* evaluateLocator(locator) highlights matched elements
* Shadow DOM selectors use ::shadow or Playwright chaining
* Iframe selectors use iframeSelector >>> elementSelector

🎨 UI Architecture

Sidepanel Sections

* **Options & Status**: Capture mode toggle, theme toggle, status bar
* **Evaluate & Test**: Locator input, match count, help panel
* **Generated Locators**: Table of locator types with copy buttons
* **Element Hierarchy**: DOM tree viewer with shadow/iframe indicators
* **Saved Locators**: Searchable list with copy/delete/undo

Styling

* Theme-aware via body.dark-theme
* CSS variables for color and layout
* Compact mode via compact.css
* Highlighting via .sh-highlight-depth-N, .sh-highlight-main, .sh-highlight-blocker

🧠 Messaging Architecture

| **Source** | **Target** | **Method** |
| --- | --- | --- |
| Background | Content | chrome.tabs.sendMessage |
| Content | Sidepanel | chrome.runtime.sendMessage |
| Sidepanel | Content | chrome.tabs.sendMessage |
| Iframe | Parent | window.postMessage |

🧰 Storage Schema

{ "captureMode": true, "isDarkTheme": false, "savedXPaths": [ { "id": 123456, "locator": "//input[@id='email']", "name": "Email Field", "type": "XPath", "dateSaved": "2025-08-15T12:00:00Z", "matchCount": 1, "wasNameProvidedByUser": true } ] }

🔐 Security Practices

* Avoids eval() and unsafe DOM access
* Validates selectors before evaluation
* Handles cross-origin iframe restrictions gracefully
* Uses scoped messaging and defensive checks
* Stores data locally via chrome.storage.local

🧪 QA Checklist

| **Feature** | **Test** |
| --- | --- |
| Capture Mode | Hover/click highlights elements |
| Locator Generation | All types generate correctly |
| Match Count | Unique/multiple detection |
| Shadow DOM | Elements inside shadow roots |
| Iframe Support | Elements inside iframes |
| Save/Search | Locators persist and filter |
| Theme Toggle | Light/dark switch works |
| Keyboard Shortcut | Ctrl+Shift+X toggles mode |
| Hierarchy Viewer | DOM tree renders correctly |
| Suggestions | Dropdown shows relevant locators |

🧠 Extending the Extension

Add New Locator Type

1. Create generator in content.js
2. Add to generateAllLocators()
3. Update UI in sidepanel.js

Add New UI Section

1. Modify sidepanel.html
2. Style in style.css
3. Add logic in sidepanel.js

Integrate External API

1. Add permission in manifest.json
2. Use fetch() or messaging to call API
3. Display results in sidepanel