ID Card Toolkit

الهيئــة الاتحادية للهـوية والجنسيـة

FEDERAL AUTHORITY FOR IDENTITY & CITIZENSHIP

ID Card Toolkit - Technical Overview - v1.21

Revision History

Version	Date	Description of changes
1.0	22nd Feb, 2017	ID Card Toolkit Beta 1
1.1	17th Apr, 2017	ID Card Toolkit Beta 2
1.2	9th Aug, 2017	ID Card Toolkit Beta 3
1.3	23rd Feb, 2018	Release Version 1.0.0
1.4	14th Mar, 2018	Release Version 1.0.2
1.5	30th Mar, 2018	Release Version 1.0.3
1.6	12th Jun, 2018	Release Version 1.0.6
1.7	31st Oct, 2018	Release Version 1.0.9
1.8	15th Jan, 2019	Release Version 1.0.10
1.9	27th Jan, 2019	Release Version 1.0.11
1.10	19th Dec, 2019	Release Version 1.4.4
1.11	26th Mar, 2020	Release Version 1.4.5
1.12	10th Aug, 2020	Release Version 1.4.7
1.13	14th Aug, 2020	Release Version 1.4.7
1.14	21th Oct, 2020	Release Version 1.4.8-r2
1.15	24nd May, 2021	Release Version 1.4.9
1.16	12th Jul, 2021	Release Version 1.4.9-r2
1.17	18th Oct, 2021	Release Version 2.0.2-r2
1.18	05th Nov, 2021	Release Version 2.0.3-r2
1.19	21st Mar, 2022	Release Version 2.0.4
1.20	12th Aug, 2022	Release Version 2.0.5-r2
1.21	29th Oct, 2022	Release Version 2.0.6-r1

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Abbreviations

API	Application Programming Interface
ICA	Identity & Citizenship Authority
JWS	Java Web Start
NFC	Near Field Communication
NPAPI	Netscape Plugin Application Programming Interface (NPAPI)
OTG	USB On-The-Go
PCSC	Personal Computer Smart Card
PKI	Public Key Infrastructure
REST	Representational State Transfer
SDK	Software Development Kit
SP	Service Provider
USB	Universal Serial Bus
VG	Validation Gateway, provided by ICA
VPN	Virtual Private Network

1 Introduction

The Identity & Citizenship Authority (ICA) has developed the ID Card Toolkit to address the requirements of service providers (SP) to integrate: Identification, Authentication, Digital Signature and Non-repudiation services, based around the capabilities of the Emirates ID Card, into their business applications. The Toolkit is comprised of a number of Software Development Kits (SDK) supporting different programming languages and platforms. Programming language specific developer guides and samples are provided as part of each SDK to support developers with Toolkit integration.

The Toolkit also provides a migration path for SPs that have existing web applications using ICA's Validation Gateway (VG) Applet and ActiveX components. With minimal changes an existing web application can be upgraded to the new Toolkit.

1.1 Purpose

This document provides a high-level technical overview of the ID Card Toolkit to familiarize SPs with the supported: services, programming languages, platforms and devices. The document also introduces the integration model options and provides an overview of the migration path for SPs using ICA's legacy VG Applet and ActiveX components.

2 Supported Services, Programming Languages, Platforms & Devices

2.1 ID Card Toolkit Services

The Toolkit provides support for the following services:

1) Read public data
2) Read family book
3) Export PKI certificates
4) Check ID Card validity
5) Authenticate biometric
6) Reset PIN
7) Authenticate PIN
8) Unblock PIN
9) Digital signature of documents (e.g.: PDF, XML, etc.) and data
10) Verify digital signature
11) Authenticate PKI

2.2 Supported Platforms

The Toolkit is tested on the following combination of platforms and versions. Other versions of these platforms may function correctly but are not officially tested or supported.

- Windows 7, 8, 10
- Windows Server 2008, 2012
- Linux (Ubuntu 15.10 Desktop & RHEL 7)
- Mac OS X (10.10, 10.11, 10.12)
- Android 4.4 to 7
- iOS 8, 9, 10

2.3 Supported Programing Languages

The following matrix shows the operating system support provided by each of the programming language specific ICA Toolkit SDKs.

OS SDK	Windows	Linux	Mac OS	Android	iOS
C/C++	✓	✓			
Objective C			✓		✓
Swift			✓		✓
Java	✓	✓	✓	✓	
.NET	✓				

2.4 Compatible Smartcard & Fingerprint Reader Devices

The smartcard and fingerprint readers that are compatible with the Toolkit are listed in the table below. Please carefully read the following notes before purchasing a device.

Notes:

- The details provided in the table are based on the information available to ICA at the time of releasing this document. It is possible that a device manufacturer will release updates to a device while maintaining the same model's name. These updates may not be compatible with the Toolkit. One example of this is the Morpho MSO 1350, which has multiple versions under the same model's name. Version 2 of the device is compatible Toolkit, whilst version 3 is not. Unfortunately, the device version is not included in the publicly available data sheets and specifications for the device, so this can potentially cause some confusion.
- Before purchasing devices in bulk, it is recommended that firstly, compatibility with the specified device SDK versions is confirmed with the manufacture or reseller. Secondly, a sample of the specific device should be tested with the Toolkit to ensure any hardware or firmware updates have not broken compatibility.

#	Vendor	Model	Features/ Capability	Connectivity	Card Interface	Platforms
1	Morpho	MSO 1350 (v2,v3)	Smartcard Reader (Plugin support available for CCID USB Smartcard Interface), Biometric Reader (Plugin support available for MorphoSmart_SDK_6.32.0.0)	USB	Contact	Windows
2	Morpho	MSO 1350 (v2)	Biometric Reader (Plugin support available for MorphoSmart_SDK_6.14.5.0), Smartcard Reader (Not Supported)	USB	Contact	Linux
3	Feitian	bR301	Smartcard Reader (Plugin support available for Feitian SDK v1.31.5))	Bluetooth	Contact	Windows, Android & iOS
4	Feitian	bR301	Smartcard Reader (Plugin support available for Feitian SDK v1.31.5))	USB	Contact	Windows, Linux & Mac OS X

5	Feitian	iR301-u	Smartcard Reader (Plugin support available for Feitian SDK v1.31.5)	Lightning	Contact	iOS
6	Feitian	iR301-uc	Jacket type Smartcard reader for iPads (Plugin support available for Feitian SDK v1.31.5))	Lightning	Contact	iOS
7	ACS	ACR38u	Smartcard Reader (Plugin support available for ACS SDK 1.1.5)	OTG	Contact	Android
8	ACS	ACR 122u	Smartcard Reader (Plugin support available for CCID USB Interface)	USB	NFC	Windows
9	Smart Phones	Android phones that support NFC	Smartcard Reader (Plugin support available for Android NFC interface)	N/A	NFC	Android
10	Any	PCSC CCID compatible	Smartcard Reader (Plugin support available for CCID USB Interface)	USB	Contact	Windows, Linux & Mac OS
11	TazTag	TazPad ID (v1 & v2)	Tablet + Inbuilt: Smartcard Reader (Plugin support available for ACS SDK 1.1.4), Biometric Reader (Plugin support available for MorphoSmart_SDK_6.14.5.0, MorphoSmart_SDK_6.22.0.0, MorphoSmart_SDK_6.34.1.0)	N/A	Contact	Android
12	Safran Morpho	Morpho Tablet 2S	Tablet + Inbuilt: Smartcard Reader (Plugin support available for ACS SDK 1.1.4), Biometric Reader (Plugin support	N/A	Contact	Android

			available for MorphoSmart_SDK_6.14.5.0, MorphoSmart_SDK_6.22.0.0, MorphoSmart_SDK_6.34.1.0)			
13	Gen2wave	RP1600	Handheld Device + Inbuilt: Smartcard Reader (Plugin support available for Smartcard and fingerprint Reader for RP1600 SDK)	N/A	Contact	Android
14	Gen2wave	EID 10 Plus	Handheld Device + Inbuilt: Smartcard Reader, Biometric Reader (Combi Plugin support available for Smartcard Reader and Fingerprint Reader for EID 10 Plus SDK)	N/A	Contact	Android
15	Gen2wave	RP70A Bio	Tablet + Inbuilt: Smartcard Reader, Biometric Reader (Combi Plugin support available for Smartcard Reader and Fingerprint Reader for RP70A Bio SDK)	N/A	Contact	Android
16	Smart Phones	iPhone with NFC Support	Smartcard Reader (Plugin support available for iOS NFC interface). (iPhone 7 or later with iOS 13 or Above)	N/A	NFC	iOS
17	GD-Innovations	Nefcom LBR20	Jacket type : Smartcard Reader, Biometric Reader for iPads and iPhones (Combi Plugin support available for	Lightning	Contact	iOS

			Smartcard Reader and Fingerprint Reader for LBR20 SDK_v3.3.0.1)			
18	Identos GmbH	Tactivo Mini for Android - Optical	Smartcard Reader, Biometric Reader (Combi Plugin support available for Smartcard Reader and Fingerprint Reader SDK v2.0.2)	USB	Contact	Android
19	Grabba	S Series	Jacket and USB type: Smartcard Reader, Biometric Reader (Plugin support available for Smartcard Reader and Fingerprint Reader SDK V1.195.6.0.1)	USB	Contact	Android
20	Telpo	TPS360	Handheld Device + Inbuilt: Smartcard Reader, Biometric Reader (Combi Plugin support available for Smartcard Reader and Fingerprint Reader for TPS360 SDK)	N/A	Contact	Android
21	Ekemp	Digit9 IAM M8 Artisecure Suprema	Tablet + Inbuilt: Smartcard Reader (Plugin support available for Artisecure's proprietary, SDK _v1.0.0), Biometric Reader (Plugin support available for Suprema BM-Slim2, Ultra-SIM FAP20, SDK_v20)	N/A	Contact	Android
22	DUNN BioPOS	BioPOS-100	Handheld Device + Inbuilt: Smartcard Reader, Biometric Reader (Combi Plugin	N/A	Contact	Android

			support available for Smartcard Reader and Finger print Reader for BioPOS-100 SDK v 1.1.2)			
23	DUNN BioPOS	BioPOS-100	Handheld Device + Inbuilt: Smartcard Reader, Biometric Reader (Plugin support available for dsap_biopos_1.1.2)	USB	Contact	Windows
24	Wisecard	WCT-S8 SmartPOSTerminal	Handheld Device + Inbuilt: Smartcard Reader, Biometric Reader (Combi Plugin support available for Smartcard Reader and Fingerprint Reader for SPOS-4.0.8 SDK)	N/A	Contact	Android
25	Secugen	Hamster Pro Duo SC PIV	Handheld Device + Inbuilt: Smartcard Reader, (Plugin support available for CCID USB Smartcard Interface), Biometric Reader (Plugin support available for SG_DEV_FDU03, SG_DEV_FDU05 model devices)	USB	Contact	Windows
26	Dermalog	Dermalog ZF1 Scanner	Handheld Device + Inbuilt: Biometric Reader (Plugin support available for Dermalog ZF1 Scanner)	USB	Contact	Windows
27	Idemia	IDScreen Biometric Tablet	Tablet + Inbuilt: Combi Plugin available for Contact Idemia Smartcard Reader	N/A	Contact	Android

			and Idemia CBM E3 Fingerprint Sensor. Plugin supports ID Screen SDK 1.2			
28	Identos GmbH	Tactivo Mini for iOS	Smartcard Reader (Plugin support available for Smartcard Reader SDK v2.23)	USB	Contact	iOS
29	Feitian Chengxin	Paysky Smartbox v7 POS Device	Handheld Device + Inbuilt: Combi Plugin available for Contact Paysky Smartcard Reader and Feitian Fingerprint Sensor. Plugin supports Paysky smart card SDK v1.0.0 and Feitian fingerprint SDK v1.0.9	USB	Contact	Android
30	Renderex Computers	Renderex Computers Smart Device	Smart Device for reading Emirates ID with QR Scanner and Fingerprint Sensor (Combi Plugin support available for Renderex Computers Smartcard Reader and FingerPrint sensor).	USB	Contact	Windows
31	OMA Emirates Group	OM-A880	Handheld POS Terminal with inbuilt smartcard reader	USB	Contact	Android

2.5 Contact vs Contactless (NFC) Card Interfaces

The following table lists the Toolkit services supported via card reader contact and contactless (NFC) card interfaces.

#	ID Card Function	Communication Mode	
		Contact Less (NFC)	Contact
1	Read public data	✓	✓
2	Read family book		✓

3	Export PKI certificates		✓
4	Check ID Card validity		✓
6	Authenticate biometric on server	✓	✓
7	Reset PIN		✓
8	Authenticate PIN		✓
9	Unblock PIN		✓
10	Digital signature of documents and data		✓
11	Verify digital signature		✓
12	Authenticate PKI		✓

3 Integration Phases & Prerequisites

The process of integrating Toolkit services follows three phases:

1. Development and Testing
2. Certification
3. Production Migration

Each of these phases has a number of prerequisites. Since the Toolkit leverages the services of ICA's VG, connectivity to a VG instance is a generally applicable prerequisite across all phases.

Note: ICA will assign a service delivery manager to each SP to provide guidance and support in fulfilling all of the prerequisites and supporting documentation requirements.

The prerequisites for each phase are highlighted in the following sub-sections:

3.1.1 Development and Testing

The prerequisites for developing, testing and integrating with the Toolkit are as follows:

1. Developers working with the Toolkit must have experience in at least one of the supported programming languages.
2. Connectivity to the Pre-Production instance of VG. The Pre-Production environment is accessed via a Virtual Private Network (VPN).
3. A license file is required to test services in the Pre-Production environment.
4. Test ID cards are required for the Pre-Production environment.

3.1.2 Certification

Once the SP has completed development and testing, certification of the integration can be scheduled with ICA. Aside from the fact that development and testing must be completed, there are no additional pre-requisites above and beyond those specified for development and testing. Certification is conducted in the same environment – Pre-Production.

3.1.3 Production Migration

After certification is granted by ICA the integration is ready to migrate to production. There are two pre-requisites for production migration:

1. A production license file issued by ICA.
2. Dedicated connectivity to the production VG environment.

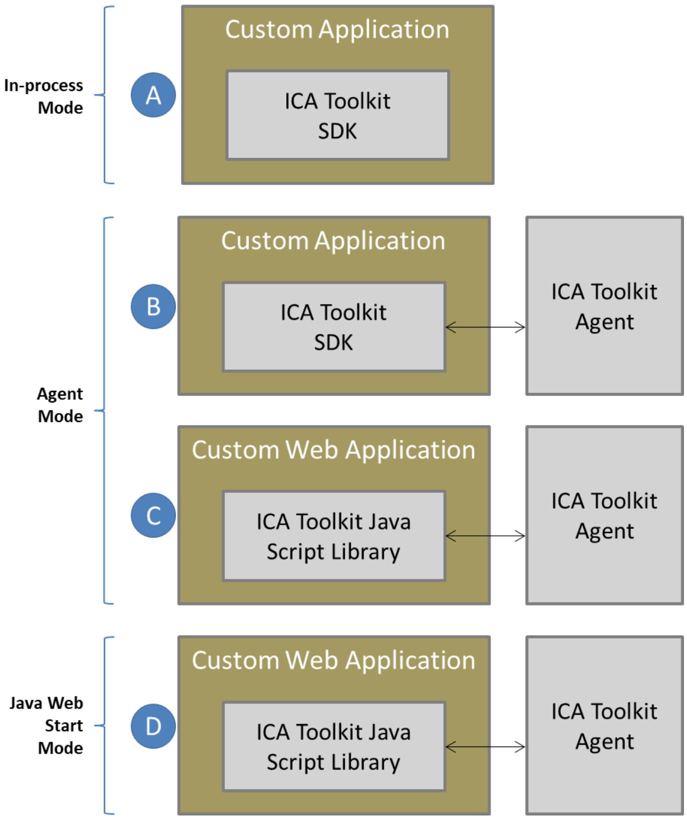
4 ID Card Toolkit Modes of Integration

The Toolkit supports three modes of integration:

1. **In-process Mode** - supports the development of **(A)** standalone applications that embed the Toolkit library. This will include thick-client desktop applications and mobile apps.

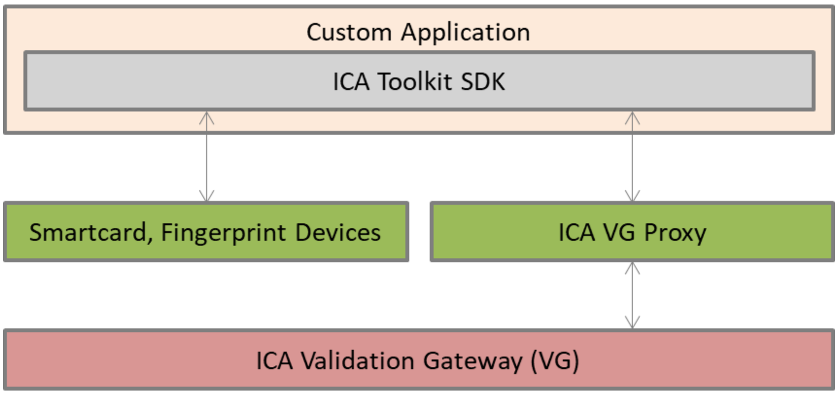
2. **Agent Mode** – supports the development of **(B)** standalone applications and **(C)** web applications. In this mode the ICA Toolkit Agent runs in a separate process and handles all interactions with ICA's VG, card readers and finger print readers. The Toolkit Agent must be pre-installed.

3. **Java Web Start (JWS) Mode** - supports the development of **(D)** web applications. In this mode the Toolkit Agent is dynamically downloaded and run as a JWS application – pre-installation of the Agent is not required, however the Java runtime must be pre-installed.



4.1 In-process Mode

The Toolkit SDK can be fully embedded within desktop and mobile applications. The mode of deployment is referred to as 'In-process Mode'. The following diagram depicts the collaborating components for an 'In-process Mode' deployment.

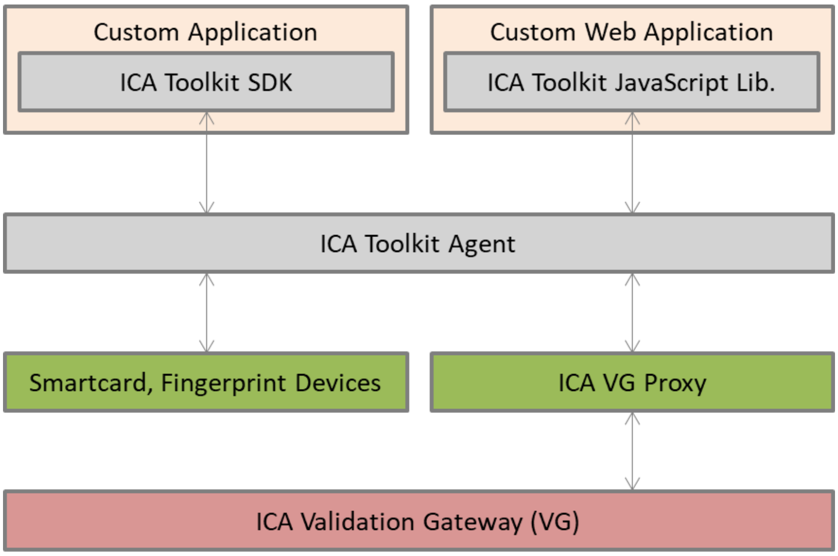


Note: For mobile app development, 'In-process Mode' is the only available option for deployment.

4.2 Agent Mode

In the 'Agent-Mode' the Toolkit services are exposed through a standalone background application or service – the Toolkit Agent. The Agent handles all interactions with ICA's VG, card readers and finger print readers. The Toolkit SDK and Toolkit Java Script library access the services provided by the Agent through a custom communication protocol. As a prerequisite for 'Agent-Mode' the Toolkit Agent must be installed on the desktop client before any custom applications can be executed properly. A single Agent installation can support multiple applications on the same device.

The diagram below illustrates the collaborating components for an 'Agent-Mode' deployment. Custom desktop and mobile applications use the Toolkit SDK corresponding to the programming language used for the application development. At deployment time, the application is packaged with the SDK runtime components. Similarly, custom web applications use the Toolkit Java Script library to communicate with the Toolkit Agent. The JavaScript library will be deployed on the web server along with other resources that are loaded by the application in the web browser.


Custom Application
ICA Toolkit SDK
Custom Web Application
ICA Toolkit JavaScript Lib.
ICA Toolkit Agent
Smartcard, Fingerprint Devices
ICA VG Proxy
ICA Validation Gateway (VG)

4.3 Java Web Start (JWS) Mode

The JWS mode is a variant of Agent mode. In this mode the Agent runs as a standalone background application, however in this case pre-installation is not required. The JWS files that are launched by the custom application are deployed on a web server.

4.4 In-process vs. Agent Mode

The pros and cons In-process vs. Agent Mode is highlighted in the table below:

Toolkit Mode	Pros	Cons
In-Process Mode	• Separate installation of Toolkit not required • Admin privileges are not required for deployment • No dependency on external Toolkit component	• Developer needs to download latest Toolkit updates, recompile the application and redeploy • Only supported for standalone applications
Agent Mode	• Automatic installation of updates from ICA • Toolkit Agent can support both standalone applications as well as web applications	• Separate installation of Toolkit is required • Admin privileges are required for deployment of the Toolkit Agent • This mode is not supported for mobile platforms
Java Web Start Mode	• Mainly supports web applications • Separate installation of Toolkit not required • Admin privilege is not required for launching the Toolkit agent	• The user experience is not consistent and smooth across all browsers

5 API Interaction Sequence

A common sequence of API calls is required to integrate any of the toolkit services. The following table highlights this sequence for the Read Public Data service.

#		
1	Initialize	The Initialize function or constructor in object oriented languages is called to establish the Toolkit context. The function accepts three parameters: 1. Modes of integration (In-process or Agent), 2. Application specific Configuration parameters This function is called only once for the whole application.
2	ListReaders	Lists the names of all connected smartcard and fingerprint readers. Only supported devices will be listed.
3	Connect	Connect to a specific smartcard reader specified by the reader name retrieved from the ListReaders function. After a successful connection the application receives a handle to the reader which needs to be passed to the subsequent Toolkit API functions. This function must be called every time an ID card is connected to the card reader or if the card reader is unplugged and reconnected. Once connected, the application can perform multiple Toolkit services.
4	ReadPublicData	The function to perform the service, in this case Read Public Data, is invoked with a handle to the connected device. Developers need to provide a Request ID to access the services. Please refer to section 7.4 on how to generate Request ID. Toolkit returns the service responses in digitally signed XML format that includes the Request ID provided by the Application. Application developers are expected to verify the Toolkit Response signature and validate that the Request ID is the same what provided to the Toolkit service. These way applications can ensure that the Toolkit responses are authentic.
5	Disconnect	This function should be used to disconnect the card after use of the required card services is completed. The ID card can be safely removed from the reader after disconnect.
6	Cleanup	The cleanup function must be invoked once for the application, e.g.: during shutdown. This cleans up and resets the Toolkit service context and related states.

6 Migrating Applications from Legacy Toolkit

The previous version of the Toolkit SDK provides Java Applet and ActiveX components for SP web applications to access the ID card. However due to the changing browser trend these technologies is rendered obsolete. SPs need to migrate existing applications to the new Toolkit. The following note summarizes key browser trends that impact the usage of Applet and ActiveX technologies.

The web browser trends indicate a concerted effort in IT industry to move away from proprietary, legacy NPAPI based browser plugins towards adopting architectures based on standard compliance and browser interoperability. Java Applet and Microsoft ActiveX technologies that remained in mainstream web development enabling rich content based and interactive web sites and applications rely on the browser-plugin capabilities. Hence the applications that use these plugins will not be able to access their functionality without browser support. The following table provides the summary of our analysis of the mainstream browsers and their support strategies for ActiveX and Applet technologies.

#	Browser	ActiveX	Applet
1	Microsoft Internet Explorer (IE)	Yes	Yes. According to a Microsoft announcement, support for older versions of IE ended and IE11 is the last version of Internet Explorer to continue support backward compatibility and legacy support. This allows legacy code to continue working while developers migrate to plug-in free web standards and technologies.
2	Microsoft Edge	No	No. From the first release Edge browser does not support plugins including ActiveX and Java Applets for better performance and interoperability with other browsers.
3	Google Chrome	No	No. - Starting with Chrome version 45 (released September 1, 2015), Chrome has disabled the standard way in which browsers support plugins and thereby technologies like Java Applet. - Chrome on Android from the start don’t support plug-ins and hence Java Applet
4	Mozilla Firefox	No	Yes. Mozilla announced plans to remove support for most of the NPAPI plug-ins in Firefox by end of 2016. This would also result in end of Java Applet support in Firefox.
5	Apple Safari	No	No. The Safari 10 released on September 20, 2016, by default starts with plug-ins disabled [3]. Apple recommends developers to migrate to plug-in free technologies. Safari browser on iOS too don’t support plug-ins and hence doesn’t support Java Applet

In addition to the above factors, Oracle has deprecated the Java browser plugin as well as the Applet APIs in JDK 9 thereby ending official support to Java Applets.

According to a Gartner analysis report, IE 11 will continue support legacy enterprise needs, whereas all other main stream browsers are going to be designed around de-facto standards with support for rapid updates. Based on the analysis, Gartner strongly recommends a browser-independent strategy for rolling out modern web applications.

The current Toolkit overcomes the browser plugin limitations using REST and Web Socket protocols. And considering the migration challenges, the Toolkit includes a drop in replacement for the current VG Applet used by the SP applications. SPs migrating from the Current Toolkit to the New Toolkit need to update to the new Toolkit Applet which will provide backward compatible APIs for migration. However, it is recommended to migrate to the full featured new Toolkit Java Script library to overcome the limitations of the Java Applet technology and for improved user experience.