



# City of Los Angeles Application Modernization Strategy



Hosting



Security



Version



Mobile



Resilience

# TABLE OF CONTENTS

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MODERN SOFTWARE APPLICATIONS: WHY THEY MATTER.....	<a href="#">2</a>
L.A. CITY STANDARDS FOR MODERN SOFTWARE APPLICATIONS	
• How to Build Modern Software Applications (Our Methods) .....	<a href="#">4</a>
• Components of Modern Software Apps (Our Technologies).....	<a href="#">9</a>
APPLICATION MODERNIZATION PLAYBOOK	
• Legacy Applications Defined.....	<a href="#">16</a>
• Scenario #1 - Modernizing Your Version Status.....	<a href="#">19</a>
• Scenario #2 - Updating Your Hosting Platform.....	<a href="#">20</a>
• Scenario #3 - Making Your Application Mobile Responsive.....	<a href="#">22</a>
• Scenario #4 - Securing Your Application Against Cyber Attacks .....	<a href="#">23</a>
• Scenario #5 - Ensuring Continuity Through Disaster Recovery.....	<a href="#">25</a>
Assistance & Available Contracts.....	<a href="#">28</a>
Acknowledgements.....	<a href="#">29</a>

# MODERN SOFTWARE APPLICATIONS: WHY THEY MATTER

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We live in a digital era. Over 85% of Americans own a smartphone, 75% own a desktop or laptop computer, and over half own a tablet (Pew Research Center, *Mobile Fact Sheet*, 2021). Mobile devices account for over 59% of Internet website traffic (Statista, 2022), so Angelenos expect their government to be online, easy-to-use, and accessible from any computing device. This requires the City of Los Angeles to provide modern digital services to our employees, contractors, residents, businesses, and visitors.

## ***COVID-19 Accelerated the Need for L.A. City Digital Transformation***

At no time was this more apparent than the COVID-19 pandemic. The COVID-19 pandemic disrupted our world. To stop the spread, City of L.A. facilities and public counters had to close in-person services and shift to “contactless” digital services. And while the virus had many terrible consequences for Angelenos, the pandemic has been a catalyst for improving the quality and availability of digital government services. After two months of reviewing 97 different City of Los Angeles services impacted by COVID-19, the Information Technology Agency (ITA) along with 150+ L.A. City department staff identified 13 key technologies that dramatically improve how residents and businesses digitally engage L.A. City government. Those 13 technologies were adopted as a digital playbook, and incorporated into the [City of L.A. Digital Strategy: COVID-19 Pandemic & Beyond](https://ita.lacity.org/news/ita-publishes-city-los-angeles-digital-strategy-covid-19-pandemic-beyond) (<https://ita.lacity.org/news/ita-publishes-city-los-angeles-digital-strategy-covid-19-pandemic-beyond>) that is driving improvements in our government services. However, the delivery of “contactless” government services in response to COVID-19 is just part of the necessary digital transformation required at the City of Los Angeles. Antiquated paper-based processes still need to be digitized, existing digital services need to be integrated with a focus on good user experiences, and numerous legacy applications central to government operations need to be modernized.

## ***Importance of Modernizing L.A. City Legacy Business Systems***

Under the leadership of Councilmember Monica Rodriguez, Councilmember Bob Blumenfield, and the Information Technology & General Services Committee chaired by Councilmember Nithya Raman, the Los Angeles City Council approved

[Council Motion 21-0433](https://clkrep.lacity.org/onlinedocs/2021/21-0433_misc_04-20-21.pdf) ([https://clkrep.lacity.org/onlinedocs/2021/21-0433\\_misc\\_04-20-21.pdf](https://clkrep.lacity.org/onlinedocs/2021/21-0433_misc_04-20-21.pdf)) in March 2022. This motion gave instruction that:

- technology has been key in responding to the COVID-19 pandemic and is relied on by employees, residents, and contractors,
- the City of LA has underlying legacy platforms that must be modernized,
- the Information Technology Agency (ITA) should work with City departments to conduct an inventory of all legacy business systems currently in use,
- city departments, including the ITA, should develop a plan to replace their systems and bring them up to standard, including the use of Cloud computing to replace these legacy systems by 2025, if possible.

Pursuant to the Council Motion, the Information Technology Agency [published a memo to L.A. City departments](#) to perform the following:

1. Inventory department software applications using the ServiceNow system,
2. Analyze and identify modern vs. legacy department systems, and
3. Develop modernization recommendations for legacy systems, using the FY23-24 budget process for departments to request funding, if needed.

Using the Information Technology Policy Committee (ITPC) attended by IT managers across all L.A. City departments, the ITA completed the department software application inventory in collaboration with departments in July 2022, provided analysis of legacy vs. modern applications in August 2022, and distributed a list of department legacy applications to each department. Now, the ITA is providing modernization recommendations in the form of this City of Los Angeles Application Modernization Strategy, including industry best practice recommendations, available software platforms & contract vehicles, Cloud hosting and software as a service options, lessons learned for successful application modernization at LA City, and specific modernization recommendations depending on the issues suffered by specific legacy applications.

Modern government operations require modern software applications and integrated digital services. Using this Application Modernization Strategy, the City of L.A. is positioned to take advantage of the digital shift that occurred during the COVID-19 Pandemic, and recover to a “new better” not just a “new normal.”

Ted Ross  
General Manager and CIO  
City of Los Angeles, Information Technology Agency



## L.A. CITY STANDARDS FOR MODERN SOFTWARE APPLICATIONS

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By definition, technology is constantly changing. Today’s modern applications will become tomorrow’s legacy applications as new methods, technologies, and customer requirements innovate the world of digital services. And while it may seem exasperating to keep up with all of the trends and innovations, there are overarching methods that are more important than the technologies themselves. In other words, how you approach application modernization is as important as what you include in your modern apps. For this reason, the following City of Los Angeles Standards for Modern Software Applications include both the “how” (methods) and the “what” (technologies) of application modernization. These standards were developed by the Information Technology Agency through industry research, consultation with best practice organizations, and over seven years of modernizing City of Los Angeles applications in partnership with the other forty-five (45) L.A. City departments.

### ***How to Build Modern Software Applications (Our Methods)***

As every good cook knows, a good meal requires both the right method (the “how”) and the right ingredients (the “what”). Modern software also requires good overarching methods and approaches, as well as, the right component technologies. Without the right methods, software is destined to be under used, overengineered, costly, quickly obsolescent, and hard to maintain. The City of Los Angeles Standards for Modern Software Development include the following methods:

#### *Method #1 - Focus on the Customer*

Understand Requirements - The single most important success factor in providing modern software applications is a clear understanding of your intended customers and the purpose of the software. Developing modern software (or modernizing legacy software) starts with a clear picture of the business challenge or requirements for the application. There are several modern frameworks to accomplish this critical task. The simplest is basic software requirements gathering methods. Larger projects should include a more formalized Project Charter to document software goals. User Centered Design is a comprehensive iterative design process in which developers focus on users and their needs in each phase

of the software design process. Through a mix of investigative methods and generative tools, software developers understand user context, identify requirements, design solutions, and evaluate results for the purpose of building better digital services. Details about User Centered Design can be found here: <https://www.interaction-design.org/literature/topics/user-centered-design>

Solicit Customer Feedback - Another important part of understanding customer focus is the ability to receive and incorporate customer feedback. Modern software has feedback loops that allow software users to provide input and recommendations for improving the app. Basic feedback options can include an email address for users to provide feedback. Net Promoter Score (NPS) is a common automated industry method that uses a one-question best practice survey to gauge customer satisfaction and issues (<https://www.hotjar.com/net-promoter-score/>).

### *Method #2 - Make it Simple & Easy to Use*

Keep It Simple - About 80% of features in software applications are never or rarely used (Forbes, *Are Most Of Your Product's Features...Useless?*, 2019). In other words, humans have the tendency to over engineer and over complicate software applications creating unnecessary complexity, cost, and maintenance responsibilities. The best way to prevent this is through a clear understanding of the problem to be solved through the software (see Method #1) and the use of Agile software development in the creation of the software. Agile software development works to rapidly create minimal software components that customers can use and provide feedback on. Modifying and adjusting software early in the development process is the best way to prevent complicated, over engineered solutions. You can read more about Agile software development here: <https://www.agilealliance.org/agile101/>

User Experience (UX) is Key - User experience (UX) is a strong determinant of the success or failure of a software application. While “easy-to-use” seems like a very subjective measurement, this is a well established discipline with practical steps that can be incorporated into your apps ranging from simplicity of language to error recovery. You can read more about User Experience (UX) here: <https://xd.adobe.com/ideas/principles/web-design/what-makes-good-ux/>

### *Method #3 - Design for Scalability*

Start Small, But Be Ready to Scale with Cloud Computing - Scalability is the ability to grow or shrink your software application based on the changing needs of the customers. New software should often start as a “Minimum Viable Product” (MVP) that covers basic features that can then be grown with use and need. Cloud computing provides highly scalable infrastructure and value-added services for modern software applications. The Cloud is simply IT resources delivered as a service over the internet. These computing resources are available through vendors via subscription and enable City of Los Angeles departments the opportunity to “rent” Cloud software applications or hardware infrastructure. Cloud Computing expands the tools available to City departments by leveraging vendor-managed IT investments as a primary, secondary, or temporary IT resource. As a result, Cloud Services offer tremendous opportunities for City departments to lower costs, stabilize hardware spending, enhance disaster recovery, deliver “access anywhere” applications for users, and most importantly, scale IT infrastructure up or down to the demand. To learn more about Cloud Computing, check out the City of Los Angeles Cloud Services Guidelines found on InsideLA.

Build on a Platform to Future Proof Your App - The City of Los Angeles utilizes Cloud-hosted platforms (e.g. Salesforce, Microsoft Dynamics, ServiceNow, etc) to provide both scalable Cloud infrastructure and a highly configurable platform-as-a-service tool for building apps. In fact, most modern software applications at the City of Los Angeles are not being custom-built, but are part of an existing Customer Relationship Management (CRM) platform. Apps are built on the platform, scaled up or down depending on the need, and then integrated with other apps on the platform as needed. This has provided one of the most consistent benefits to LA City departments in their application development.

The Build vs Buy Decision - When departments need to acquire software, they are often faced with the “Build vs Buy” decision. In the past, many companies opted to build their own software solutions as the market was limited in choices. However, the costs and challenges of maintaining, securing, and updating those custom built solutions became apparent. Modern software solutions are now typically bought from a Cloud-hosted vendor and then configured to perform the specific functions. This software is easily configurable, full featured, and scales if the app needs to grow. There is now a virtual smorgasbord of software solutions on the market to

choose from. Fortunately, the City of Los Angeles uses a series of standards for financials, HR/Payroll, office productivity, Customer Relationship Management, Case Management, etc. In short, a department should only build its own software if the market lacks real solutions for their specific needs and they have fully measured the risks, costs, skills requirements, and time required for a custom application.

#### *Method #4 - Plan for Interconnectivity*

Modern Software Interconnects with Other Software Using APIs - Modern software applications are “service-oriented”, leveraging other applications to accomplish functions. Through the use of Application Programming Interfaces (APIs), a software application can borrow or share key data and logic with other software. This dramatically reduces the cost, effort, and maintenance requirements for modern software. This also eliminates redundant software code and multiple “versions of the truth” (i.e. one application becomes the authoritative record for customer names, another becomes the authoritative source of payments received, another becomes the authoritative source to validate LA City addresses, etc).

Modern Software Integrates the City’s IDM to Manage Users - Every software must securely establish the identity, user name, and password of its users (aka Identity Management Solution, or IDM). Fortunately, the City of Los Angeles has a citywide solution to perform this seamlessly, efficiently, and securely. City of Los Angeles employees use our enterprise IDM solution and members of the public use Angeleno Account. Once your application is connected to the City’s IDM solution, the benefits are many: users only need a single account to access a multitude of apps, users only need to log in once, users update a single profile with all of their information, users can perform simple and secure password resets using their verified email address, etc.

#### *Method #5 - Guarantee Quality*

Establish a Mindset of Innovation and Digital Thinking - Digital transformation and innovation are not products you can buy, but come from the intelligent design and implementation of targeted digital services. The combination of understanding your customers, understanding the available digital products, and a workforce that can implement these products effectively for the customers is the holy grail of every L.A. City department. To do this, your organization needs to adopt and buy into the prevailing best practices for being digital (aka establishing a holistic culture of



thinking digital). As a set of values, this includes: rapid experimentation (try new ideas, learn from results, and incorporate new insight - aka “fail fast”), Agile development (use agile development principles such as prioritizing customer satisfaction, changing requirements when necessary, building as you go, trying out the solution early and often, then making necessary adjustments), self organizing (department staff step out of their functional areas periodically and partner with other parts of the organization to solve a business problem), data-driven decisions (department staff collect and use data when making new decisions), focus on digital first (department staff consider digital, integrated solutions early in a project, considering ways to not just deliver, but transform customer experiences), streamline processes before applying technology (automation is useless without a streamlined process), and perform business process re-engineering before implementing new technology. It will make the technology much better, cheaper, easier to maintain, and faster to implement.

Utilize Competitive Bids to Understand Your Needs & Vendor Choices - Nobody likes to wait for a software application. When L.A. City departments identify a need, they understandably want to move quickly to resolve that need. However, this attempt at speed to market has often resulted in misfires and poorly thought through software solutions. A competitive bid process is an excellent opportunity to gather your requirements, build your coalition of partners (e.g. other departments), view vendor options through demonstration, re-engineer your business processes before applying technology, and secure long-term funding for your software application.

Test, Test, and Test Some More - Every software solution makes assumptions of user behavior and business processes. The very best method to check these assumptions before rolling out your software is to test it well. Bring in a good sample population of users to perform aggressive testing of your software and resolve your issues before it becomes a front-page story in the local newspaper.

### *Method #6 - Embed Security*

Incorporate Cyber Security Early in the Software Project - We live in an era of nearly constant cyber attacks and hear about periodic data breaches. However, these security breaches are highly preventable. By incorporating cyber security review early in the software project, incorporating the standards of the L.A. City Information Security Policy, and using the ongoing cyber vulnerability scanning services of the Information Technology Agency, every City department can prevent

the cost, embarrassment, and damage of data breaches. Please contact the ITA Security Desk for more information.

Add Public Facing Software to the L.A. City Cyber Watch List - To ensure the security and protection of your IT systems, departments must add the IP addresses (unique Internet identifier code) of all department public-facing applications, websites, and servers (on-premise and cloud hosted) to the 'Cyber Watch List' using the City of L.A.'s ServiceNow ("SNOW") system so they will be scanned weekly for vulnerabilities. Weekly reports are made available to your department staff of all vulnerabilities in your software. This allows rapid resolution of cyber security issues and prevents embarrassing and damaging data breaches. Please contact the ITA Security Desk for more information.

#### *Method #7 - Remember Maintainability*

Utilize L.A. City's Change Management Process to Coordinate Software Changes - Over 74% of software outages are actually caused by poorly implemented software changes. In other words, IT staff make a change to the software or infrastructure that causes the system to crash. IT Change Management is a well-defined industry best practice for preventing this. The Information Technology Agency utilizes ServiceNow to perform basic Change Management functions along with a weekly Change Advisory Board meeting to review system changes, identify unintended consequences, coordinate maintenance schedules, and prevent system outages. IT staff from every City department are welcome to join L.A. City's effective IT change management process.

Implement DevOps Practices for Software Applications - IT staff should closely integrate application development with infrastructure operations to allow streamlined software development and maintenance (aka DevOps). Well defined DevOps principles, such as collaboration, automation, and continuous improvement benefit the maintenance and value of the software application. You can read more about DevOps here: <https://www.atlassian.com/devops/what-is-devops>

#### ***Components of Modern Software Apps (Our Technologies)***

The methods listed above are fundamental to developing modern software applications. The components listed below are the key ingredients (the "what") found in the City of Los Angeles Standards for Modern Software Development:

### *Component #1 - Cloud Hosting & Connection via Cloud Pipeline*

The “Cloud” represents IT resources delivered as a service over the internet. These computing resources are available through vendors via subscription and enable City of Los Angeles departments the opportunity to “rent” Cloud software applications or hardware infrastructure. The Information Technology Agency has made accessing the Cloud easy through the establishment of a redundant Citywide Cloud Pipeline (dual 10GB paths to Amazon Web Services, Microsoft Azure, and Google Cloud). Without Cloud computing, City departments must rely on the infrastructure or software that they build in-house or purchase directly from a vendor. With Cloud computing, departments have access to a large array of software, platforms, and infrastructure that can simply be used in a pay-per-use format. The Citywide Cloud Pipeline provides secure, dedicated, and redundant access for City employees to the Cloud. Well implemented Cloud computing and use of the Citywide Cloud Pipeline provides the following benefits: lower cost (pay for what you need with no large capital investments), makes City departments more flexible and agile with easy access to tools, more secure (Cloud vendors have top-tier security, when used correctly), includes disaster recovery capabilities (hosted and recoverable off-site), empowers IT staff to perform value-add work, and Cloud pipeline provides low-cost, stable, secure access to Cloud apps. To learn more about securely accessing the Cloud (with pricing) through the Citywide Cloud Pipeline, please contact ITA-NACI via a SNow ticket.

### *Component #2 - Customer Relationship Management (CRM) Platform*

Customer Relationship Management (CRM) and Case Management systems are digital systems used to intake a request (“case”), assign to City resources, and assist in the resolution of the request. While the City of Los Angeles has various prominent CRM (e.g. MyLA311 or LADWP Billing System), replacement of many existing paper-based government services can be done using a lightweight, streamlined CRM solution. Without Case or CRM systems, constituents are required to call or visit a City building to make requests, often providing the same information repeatedly. To find the status of their request, a City employee must gain physical possession of a case file and spend valuable time providing a simple update that can be automated. A well implemented Case or CRM system provides the following benefits: simplified online intake for constituents, personalized and “contactless” interactions for constituents, automated case status and constituent

updates on progress, electronic workflow with efficient collaboration (“work management”), digital records that are less expensive and necessary for data-driven decision making (i.e. “if you can’t measure it, you can’t manage it”), resilience to natural disaster and allows remote access for teleworkers. Please contact the ITA Help Desk via SNow ticket if you have questions regarding Case Management or CRM systems (<https://snow.lacity.org/ITA/QuickTicket>) (for employee use only, link must be accessed from within the LA City network).

### *Component #3 - Application Programming Interfaces (APIs) & Micro Services*

Application Programming Interfaces (APIs) are electronic communications between two software applications (e.g. between ITA’s 3-1-1 CRM and Bureau of Engineering’s mapping system for address validation). Microservices are a computer architecture approach where software is built as a collection of different services or APIs. In short, APIs are methods for software to communicate directly with each other and microservices is the building of software that takes full advantage of these APIs. Without APIs or microservices, software must be built completely from the ground up and has little interconnection with other software. This is very inefficient and makes updating software very expensive and difficult. In addition, microservices allow software systems to use the very best solution for each component (i.e. the best platform for maintaining User IDs and passwords, the best reporting tool, the best CRM capabilities, etc). In short, it is not good enough to just be digital, the best organizations are *digital and interconnected*. A well implemented API or microservices architecture provides the following benefits for modern software applications: software becomes faster to build and easier to modernize, software becomes easier to build and maintain (more object oriented), department IT staff are more efficient by using existing APIs for features, and department digital services become more innovative by combining different capabilities together that are readily accessible through APIs.

The Information Technology Agency has established a citywide API management tool contract with Apigee. Please contact the ITA-API-Management team via SNow ticket if you have questions regarding APIs (<https://snow.lacity.org/ITA/QuickTicket>) (for employee use only, link must be accessed from within the LA City network)..

### *Component #4 - GitHub for Version Control*

GitHub is a hosted service built on the open source distributed version control software called Git. A distributed version control system allows multiple developers

to contribute to software projects, provides branching and merging capabilities, tracking of pull requests, code contributions, versioning, and the synchronization of code across multiple repositories. In other words, GitHub is a central repository for securely managing updates to software. In collaboration with other LA City departments, ITA selected GitHub as a hosted service for Git which provides core Git functionality along with bug tracking, user management, and an extended plugin and integration capabilities. In using GitHub, development teams have a common environment for securely publishing their source code, automating code deployment processes, and using tools such as DependencyBot to scan code submissions for known vulnerabilities and outdated code libraries.

The Information Technology Agency has established a citywide license for GitHub. Please contact the ITA-DevOps team via SNow ticket if you have questions regarding GitHub (<https://snow.lacity.org/ITA/QuickTicket>) (for employee use only, link must be accessed from within the LA City network)..

### *Component #5 - Modern Programming Languages*

Programming languages are used to implement sets of instructions for computers. Modern programming languages provide clear specifications and documentation, have a large pool of developers and investment in frameworks and common libraries, and can be implemented on local and cloud infrastructure. ITA recommends using .NET/C#, Python, Java, Javascript client-side (i.e. React, Vue) and server-side (i.e. Node.js) for application development, integration, and scripting. Each language has its own set of benefits and specialities depending on the use case and system requirements. These languages are well documented, have numerous online learning courses, and have a large developer ecosystem. Whether you are developing a full-stack application for your on-premise datacenter or building out an application on serverless cloud functions, these languages can be used to achieve your desired results.

The following StackOverflow survey of 70,000 programmers demonstrates the most popular programming languages currently used among businesses:  
<https://survey.stackoverflow.co/2022/#most-popular-technologies-language>

### *Component #6 - E-signature for Contactless Approvals*

Electronic signatures (e-signature) are an electronic process that indicates acceptance of an agreement or record. E-Signatures allow departments to accept

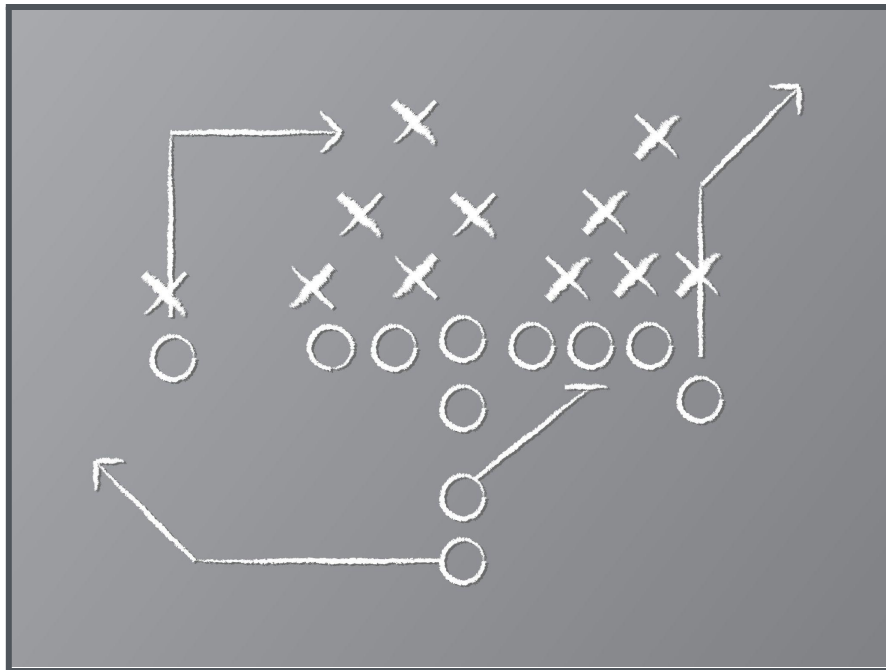
a digital, not handwritten, signature as a legally binding acceptance of an agreement and then store the signature in a database for recordkeeping. E-signatures are codified in the Electronic Signatures in Global and National Commerce (ESIGN) Act and Uniform Electronic Transactions Act (UETA). E-signatures have the same legal status as handwritten signatures across the United States. E-signatures are already used across many business processes at the City of Los Angeles. E-signatures are fundamental to digital and “contactless” government services. Without e-signature, a City of Los Angeles department is limited in the services they can provide to residents or businesses, as various use cases will require a formal signature process along certain checkpoints (e.g. sign-off on a permit). A well implemented e-signature platform provides the following benefits: faster signature processes (immediate transmission or acceptance), better customer experience for anytime, anywhere sign-off, “contactless” and COVID-19 safe, promotes simplified business processes, enhanced security to ensure the proper entity is signing, integrates with electronic workflow for signature routing, paperless and environmentally sustainable, secure signature storage with recovery in case of natural disaster, and less cost than physical wet-signature processes. A citywide and cost effective e-signature contract with Adobe Sign has been established by the Information Technology Agency. Please contact the ITA eSign team via SNow ticket if you have questions regarding e-signature (<https://snow.lacity.org/snow/esignlicensing>).

### *Component #7 - Citywide Identity Management Solution*

The City of Los Angeles uses two unified digital identity management (IDM) platforms for the City of Los Angeles (Google Identity for employees and Angeleno Account for the public). Introduced by the Information Technology Agency, each IDM system allows employees or the public to have easy online access to all City of Los Angeles apps and websites through a single user ID and password. Prior to these IDM systems, LA City residents, businesses, and visitors were required to set up a new user account and password for each City app. This is frustrating for users, prone to security issues, expensive for City departments, and provides the City of Los Angeles with little customer information about its users and their needs. The Google Identity and Angeleno Account provide uniform access to City digital services and the following benefits: consistent, easy-to-use login screen across all City of LA apps and websites, reduces user data entry (user profile can pre-populate at new login), easy discovery of other City services by residents, less work and cost for City departments (centrally managed login screen), and top-tier security features with centralized security updates. The Google Identity system for

employees and the Angeleno Account for the public are established and maintained by the Information Technology Agency. Please contact the ITA-IDM team using a SNow ticket if you have questions regarding the Angeleno Account (<https://snow.lacity.org/ITA/QuickTicket>) (for employee use only, link must be accessed from within the LA City network)..

# APPLICATION MODERNIZATION PLAYBOOK





# APPLICATION MODERNIZATION PLAYBOOK

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Under the leadership of Councilmember Monica Rodriguez, Councilmember Bob Blumenfield, and the Information Technology & General Services Committee chaired by Councilmember Nithya Raman, the Los Angeles City Council approved [Council Motion 21-0433](https://clkrep.lacity.org/onlinedocs/2021/21-0433_misc_04-20-21.pdf) (https://clkrep.lacity.org/onlinedocs/2021/21-0433\_misc\_04-20-21.pdf) in March 2022. This motion gave instruction that:

- technology has been key in responding to the COVID-19 pandemic and is relied on by employees, residents, and contractors,
- the City of LA has underlying legacy platforms that must be modernized,
- the Information Technology Agency (ITA) should work with City departments to conduct an inventory of all legacy business systems currently in use,
- **city departments, including the ITA, should develop a plan to replace their systems and bring them up to standard**, including the use of Cloud computing to replace these legacy systems by 2025, if possible.

Pursuant to the Council Motion, the Information Technology Agency has developed the following practical Application Modernization Playbook to help modernize existing legacy apps and business systems. By combining the recent legacy app inventory with this Application Modernization Playbook, ITA assistance, and the Fiscal year 2023-24 budget process, City of Los Angeles departments are much further down the path to upgrading and replacing key legacy applications for the benefit of the public. The following playbook includes industry best practice recommendations, available software platforms that can be utilized, contract vehicles for implementation, Cloud hosting and software as a service options, and specific modernization recommendations depending on the issues suffered by specific legacy applications (see scenarios below).

## ***Legacy Applications Defined***

“Legacy” applications are antiquated software solutions in need of modernization. Legacy systems can be hard to define and so the Information Technology Agency (ITA) set about working with other City departments to establish a definition for this effort. Working with the Information Technology Policy Committee (ITPC), the ITA has identified five objective criteria that were used to make this determination. These fields were made available in the citywide ServiceNow (“SNow”) system so departments could accurately depict the status of each criteria for each system

listed in SNow. In the following sections of the Application Modernization Playbook, we provide specific scenarios of methods to resolve each of these criteria if they qualify as legacy. In other words, if an application only fails criteria #3 (Mobile Responsiveness), we provide a Scenario #3 below to help resolve this item and make the application modern. If an application fails multiple criteria, then a full replacement of the application may be preferred.

### Legacy Criteria #1 - Version Status

The 'Version Status' denotes whether the application's operating system or software version is current and maintainable or obsolete and unsupported. Software using an unsupported version represents a primary indicator of a legacy application. Unsupported versions means the app has both a lack of modern features and poses a significant cyber security risk due to the lack of ongoing security patches.

Specifically, department applications in SNow with 'Version Status' values of 'Latest Version-Supported' or 'Recent Version-Supported' will be assessed as modern, but a 'Version Status' value of 'Outdated Version-Unsupported' is a primary indicator of a legacy application.

### Legacy Criteria #2 - Hosting Platform

The 'Hosting Platform' denotes the type of server that the application is using. Software hosted on an antiquated server method (e.g. Mainframe or Physical Server) represents a lack of features, inefficient power usage, and limited disaster recovery.

Specifically, department applications in SNow with 'Hosting Platform' values of 'Cloud-Hosted', 'SaaS', or 'Virtual Machine' will be assessed as modern, but a 'Hosting Platform' value of 'Mainframe' or 'Physical Server' is a key indicator of a legacy application.

### Legacy Criteria #3 - Mobile Responsiveness

'Mobile Responsive' denotes the ability of the application to be readily used on a mobile device (smartphone, tablet). Mobile responsive applications use modern web standards or a standalone mobile app to resize screens for mobile devices. At this time, the majority of web traffic comes through mobile devices (as opposed to

traditional desktop or laptop computers) and the inability of a mobile device to easily access and use a department software application is an indicator of a legacy application.

Specifically, department applications in SNow with 'Mobile Responsive' values of 'yes' will be assessed as modern, but a 'Mobile Responsive' value of 'No' is a key indicator of a legacy application.

#### Legacy Criteria #4 - Cyber Secure

'Cyber Secure' denotes the presence of key cyber security features in the application to prevent data breach or cyber intrusion. Applications that lack these key security features represent a tremendous risk of cost, data loss, harm to reputation, and even lawsuits to the City of Los Angeles.

Specifically, department applications in SNow in the 'Cyber Secure' section that are 'Available to General Public?' should have their IP address entered so the application is scanned for vulnerabilities each week as part of the Cyber Watch List. Under 'User Authentication Method', values of 'Angelino Account (Okta)', 'Google IDM', or 'Azure AD' will be assessed as modern, but a 'User Authentication Method' value of 'Local Accounts' or 'LDAP' is a key indicator of a legacy application.

#### Legacy Criteria #5 - Disaster Recovery

'Disaster Recovery' denotes the presence of disaster recovery measures in the application to allow business continuity in case of localized or regional disaster (e.g. flood, fire, earthquake, etc). Required disaster recovery measures are detailed in the IT Disaster Recovery Policy ([https://www.insidela.org/sites/default/files/IT\\_Disaster\\_Recovery\\_Policy.pdf](https://www.insidela.org/sites/default/files/IT_Disaster_Recovery_Policy.pdf) - due to security issues, this document must be viewed from within the City network) based on the criticality or tier of the software application.

Specifically, department applications in SNow with 'Disaster Recovery' values of 'Yes' and 'Tested Annually' will be assessed as modern, but a 'Disaster Recovery' value of 'No' or 'Not Tested Annually' is a key indicator of a legacy application.

## Scenario #1 - Modernizing Your Version Status

The 'Version Status' denotes whether the application's operating system or software version is current and maintainable or obsolete and unsupported. Software using an unsupported version represents a primary indicator of a legacy application. Unsupported versions means the app has both a lack of modern features and poses a significant cyber security risk due to the lack of ongoing security patches.

### How to Modernize Your Version Status

To modernize your Version Status, you will need to perform the following:

1. Review the software and operating system versions of your application provided by the respective vendors. Are newer and supported versions available?
  - a. If a newer version is available, determine whether the software upgrades can be performed in place over the existing software. If so, proceed with the upgrades in a test environment prior to pushing the upgrade in production. Refer to the release notes to determine any system requirement changes, deprecated features, and new changes that may require notification or training for your end users.
  - b. If your version is so far behind that an in-place upgrade is not possible then check with your vendor to determine what is the recommended upgrade path.
  - c. A migration path may involve setting up new servers on local virtual machines or cloud server instances where the new software will be installed. The configuration and data from the older system can be migrated to the new servers and tested prior to switching over to the new servers with the latest version. This process will vary across systems and the upgrade and migration documentation will need to be referenced.
2. In some cases your application will be so many versions behind, that a migration path will not be available or cost effective. In other cases the application is built on a programming language that is no longer supported or is difficult to find developers to support the system. For these scenarios consider the following:

- a. Assess the core functionality of the application and the required features and use cases for the system. Are there off the shelf software products or hosted services that offer the required functionality? There may be existing software services that meet the majority of your needs out of the box and can be configured to align to the needs of the users. Assess whether current business processes can be adjusted to align with the off the shelf system to prevent expensive and time consuming customizations and difficulty upgrading to newer versions in the future.
- b. If an off-the-shelf product or hosted service cannot be leveraged then consider replatforming the application on a Software as a Service (SaaS) platform. These platforms provide a fully featured development platform and toolkit to rapidly develop your business requirements and handle core features like user management and authentication, role based access controls, form creation, workflow management, notifications, and reporting tools.
- c. If a custom full-stack application development is needed consider rewriting the application to leverage cloud hosting and serverless functions. This involves coding in a modern programming language, using hosted database services, and cloud servers and/or functions to provide the business logic.

## **Scenario #2 - Updating Your Hosting Platform**

The 'Hosting Platform' denotes the type of server that the application is using. Software hosted on an antiquated server method (e.g. Mainframe or Physical Server) represents a lack of features, inefficient power usage, and limited disaster recovery. In addition, antiquated server methods lack portability and the ability to use Cloud infrastructure.

### **How to Modernize Your Hosting Platform**

To modernize your Hosting Platform, you will need to perform the following:

1. Review the software hosting platform and confirm whether it is mainframe or physical server.

- a. *For mainframe hosted applications, the application should preferably be fully replaced with a modern software application.*
  - i. Conversion services that offer to convert a mainframe app to more current programming languages (e.g. Java or .Net) are often highly flawed, have performance issues, and are difficult to maintain.
  - ii. Comprehensive re-writing of the new code is usually required and it is often best to simply deploy a new modern application. Please refer to the previous sections of this document for standards and best practices for modern software applications. The following steps are for addressing applications hosted on a physical server.
- b. *For a physical server, assess the workload and utilization of the server and consider the following:*
  - i. Can the server workload be migrated to serverless cloud hosting functions (Platform as a Service)? Use cases include cloud storage, cloud SQL, cloud functions, cloud schedulers, etc.
  - ii. Does the server need to remain within a local datacenter? Consider converting the server to a virtual machine. Physical server to virtual server conversion tools are available such as VMWare vCenter Converter. The resulting virtual machine can be hosted in the Cloud or using the ITA data center (at an additional cost).
  - iii. Can the server be hosted in the cloud such as AWS, Azure, or Google Cloud Platform? Each cloud provider provides conversion tools to assist in migrating your server to their respective cloud infrastructure.

## **Scenario #3 - Making Your Application Mobile Responsive**

'Mobile Responsive' denotes the ability of the application to be readily used on a mobile device (smartphone, tablet). Mobile responsive applications use modern web standards or a standalone mobile app to resize screens for mobile devices. At this time, the majority of web traffic comes through mobile devices (as opposed to traditional desktop or laptop computers) and the inability of a mobile device to easily access and use a department software application is an indicator of a legacy application. When an app is mobile responsive, the layout and/or content responds or adapts based on the size of screen they are presented on. A responsive app automatically changes to fit the device accessing it. Typically, there are four screen sizes that responsive design must address: the widescreen desktop computer, the laptop, the tablet, and the smartphone.

### **How to Make Your Application Mobile Responsive**

To make your application mobile responsive, you will need to consider the following:

1. If you choose to replatform your application on a SaaS CRM platform you can leverage the out-of-the-box frameworks that will ensure that each screen in your application is mobile responsive. Additional tools are provided by the SaaS platform to further customize the mobile experience for each screen and typical devices.
2. If you choose to update your existing application you can use a responsive CSS and javascript framework to modernize your front end user interface. These frameworks provide full featured toolkits to simplify development of user interface screens including typography, navigation, layout, templates, and other interface items.
  - a. Responsive and progressive frameworks include: Bootstrap, Foundation, Materialize, React, and Vue
3. Upon implementation of a responsive framework you can use the built in developer tools on browsers such as Chrome and Firefox to test various devices and window sizes.

## Scenario #4 - Securing Your Application Against Cyber Attacks

'Cyber Secure' denotes the presence of key cyber security features in the application to prevent data breach or cyber intrusion. Applications that lack these key security features represent a tremendous risk of cost, data loss, harm to reputation, and even lawsuits to the City of Los Angeles.

### **How to Secure Your Application**

To apply two key security features to your application (vulnerability scanning of public facing apps and secure user authentication), you will need to perform the following:

1. VULNERABILITY SCANNING (CYBER WATCH LIST) - Determine if your application is accessible by the general public (i.e. available to access on the Internet and not limited to employee access behind the firewall).
  - a. If your application is not available for general public access on the Internet, proceed to Step 2 to address user authentication.
  - b. If your application is available to access from the Internet, then perform the following to ensure your IP address is part of the Cyber Watch List.
    - i. Log into the [SNow system](#)
    - ii. Find your application in the Business Services section of SNow
    - iii. On the "Cyber Security" tab, add the public facing URL or IP address of your application into the appropriate field and update the record. This will ensure your application is being scanned as a part of the vulnerability scans and any known issues are communicated to your department for timely resolution.
2. SECURE USER AUTHENTICATION - Determine the current user authentication method your app is using. The City secure solutions are Angeleno Account, Google Identity, or Azure AD. The use of local accounts or LDAP are determined as insecure and legacy.



Each application will need to be registered and configured on the Citywide Identity Management (IDM) platform. In preparation to meet with the IDM team you should consider the following:

- a. What authentication protocols does your application support?
  - i. ITA recommends using SAML or OIDC.
  - ii. A secure LDAP option can be used if the other protocols are not available.
- b. What users will be accessing your application?
  - i. Applications that are available to the general public will use the Angeleno Account for authentication.
  - ii. Applications that are used by City employees will use Google Identity for authentication.
  - iii. If your application serves both the general public and City employees your application can be configured for multiple identity providers or leverage the Angeleno account to handle a passthrough authentication to Google Identity. The ITA IDM team will work with you to assess the best options for each particular application.
- c. Do existing users need to be migrated from your existing application to the citywide IDM platform?
  - i. ITA recommends that users be provisioned in your application using a just-in-time provisioning upon the initial login.
  - ii. Bulk importing of users may be an option for the initial migration. This will be discussed with the IDM team as part of the onboarding process.

Once you have gathered the relevant information and are ready to begin the process of connecting your application to the citywide IDM platform you will open a SNow ticket and someone from the IDM team will contact you for an initial meeting.

Here is a link to request a detailed discussion with the ITA IDM team: [Open a SNow Ticket for the ITA-IDM team](#) (for employee use only, link must be accessed from within the LA City network).

## Scenario #5 - Ensuring Continuity Through Disaster Recovery

At no time do employees and the public rely on City data and systems more than during a disaster. As technology becomes more ubiquitous in business processes and digital services, the City of Los Angeles requires adequate protections and recovery for vital IT systems affected by disaster events. 'Disaster Recovery' denotes the presence of disaster recovery measures in the application to allow business continuity in case of localized or regional disaster (e.g. flood, fire, earthquake, etc). Required disaster recovery measures are detailed in the IT Disaster Recovery Policy ([https://www.insidela.org/sites/default/files/IT\\_Disaster\\_Recovery\\_Policy.pdf](https://www.insidela.org/sites/default/files/IT_Disaster_Recovery_Policy.pdf) - due to security issues, this document must be viewed from within the City network) based on the criticality or tier of the software application.

### **How to Establish Disaster Recovery for Your Application**

Disaster recovery requires applying the City of Los Angeles IT Disaster Recovery (DR) Policy guidelines (depending on system tier and criticality) and testing the DR on an annual basis. This requires the following:

1. APPLY THE CITY OF L.A. DISASTER RECOVERY POLICY - Required disaster recovery measures for each application are detailed in the City of Los Angeles IT Disaster Recovery Policy ([https://www.insidela.org/sites/default/files/IT\\_Disaster\\_Recovery\\_Policy.pdf](https://www.insidela.org/sites/default/files/IT_Disaster_Recovery_Policy.pdf) - due to security issues, this document must be viewed from within the City network). Standards are established based on the criticality or tier of the software application. The standards include the following:
  - a. IT Risk Assessment - Each department must identify, prioritize and detail the functionality of each of their systems. All system dependencies should be determined as part of this process as well.
  - b. Department IT Disaster Recovery Plans - Every department shall have specific plans for their critical systems that detail the steps needed to restore applications and make them available to users in the event of a disaster.
  - c. Data Backup Requirements - Data backup is implemented to ensure the protection and availability of data. The frequency of the backups is determined by the criticality of the system.

- i. Critical Systems (Tier 1)
  - 1. At least daily backup
  - 2. Full, differential, or incremental backups based on the nature of the system and its data structure
  - 3. Data must be moved off-site to secured facility
  - 4. Off-site data should be available for retrieval within same day
- ii. Important Systems (Tier 2)
  - 1. At least every other day backup
  - 2. Full, differential, or incremental backups based on the nature of the system and its data structure
  - 3. Data must be moved off-site to secured or department-owned facility
  - 4. Off-site data should be available for retrieval within 48 hours
- iii. Basic Systems (Tier 3)
  - 1. At least weekly backup
  - 2. Full, differential, or incremental backups based on the nature of the system and its data structure
  - 3. Data may be on-site, but separated from primary infrastructure
  - 4. Backup data should be available for retrieval within 48 hours

d. Annual Responsibilities - The Risk Assessment and Department Disaster Recovery Policy should be reviewed, updated and submitted to EMD on an annual basis as part of the Department Emergency Plan update. An annual test of the Disaster Recovery Policy must also be conducted.

2. ANNUAL DISASTER RECOVERY TESTING - Every year, your department must test the disaster recovery capabilities of your application. Depending

on the tier, criticality, and nature of the application, this would include the accessing of off-site data backups, the restoration of the system from those backups, and the confirmation of working software from a user.

3. If the previous steps were successful, then your application is now established with a disaster recovery framework to ensure business continuity.

## Assistance & Available Contracts

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### **Assistance**

For additional assistance or questions, please contact the Information Technology Agency (ITA) Help Desk and we will route your question to the appropriate ITA subject matter experts (<https://snow.lacity.org/ITA/QuickTicket>) (for employee use only, link must be accessed from within the LA City network)..

### **Available Contracts**

The Information Technology Agency facilitates a number of available software, hardware, communications, and IT services contracts.

Here is a link to the comprehensive [ITA Contracts & Procurement Intranet Site](#)\*

The site includes key resources, including:

- ITA Bench Contracts for IT services, including:
  - Customer Relationship Management (CRM) or Case Management (CM) system implementation and enhancements
  - Drupal Web Design & Content Management services
  - Data Science & Analytics services
  - Graphics & Media services
  - Oracle Siebel & Web Center services
- ITA Professional Services Contract, including:
  - Contract programmers
  - Contract systems analysts
  - Contract database administrators
  - Contract project managers
- Software & Cloud Subscriptions through Insight (see Financial Management System for GSD Contract No. 59749)

*\*Note - Due to the sensitive cybersecurity nature of our IT contracts, the ITA Contracts & Procurement site requires access from a LA City computer on the network or remote access through the Connect2LACity platform.*

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## **City of Los Angeles Departments**

Aging	Harbor
Airports	Housing Authority
Animal Services	Los Angeles Housing Department
Building & Safety	Information Technology Agency
Cannabis Regulation	Library
Chief Legislative Analyst	LA City Employee Retirement System (LACERS)
City Administrative Officer	Mayor's Office
City Attorney	Neighborhood Empowerment
City Clerk	Office of Public Accountability
Civil & Human Rights	Personnel
Community Investment for Families	City Planning
Controller's Office	Los Angeles Police Department
Convention & Tourism Development	Board of Public Works
Cultural Affairs	Public Works, Bureau of Contract Administration
Disability	Public Works, Bureau of Engineering
Economic & Workforce Development	Public Works, Bureau of Sanitation
El Pueblo de Los Angeles	Public Works, Bureau of Street Lighting
Emergency Management	Public Works, Bureau of Street Services
Employee Relations Board	Recreation & Parks
City Ethics Commission	Transportation
Office of Finance	Water and Power
Los Angeles City Fire Department	Youth Development
Fire and Police Pensions	Zoo
General Services	

*This concludes the City of Los Angeles Application Modernization Strategy.  
For more information, please visit [ITA.LACity.org](http://ITA.LACity.org)*