



# APPLICATION ARCHITECTURE RESOURCE GUIDE



# Table of Contents

Copyright .....	3
Introduction.....	4
Who is the Salesforce Certified Platform App Builder? .....	4
Learn Materials.....	5
General Resources .....	5
General Overview .....	6
Suggested Activities .....	20
Build Materials .....	24
1. Opportunity Locking .....	24
2. Process Automation Using Lightning Process Builder.....	28
3. Custom Links .....	36
Addendum Builds.....	41
Request a Practice Org.....	45
Salesforce Architect Success Group .....	46



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# Introduction

## Who is the Salesforce Certified Platform App Builder?

A Salesforce Certified Platform App Builder can assess the architecture environment, requirements, and designs solutions on the Force.com platform, leveraging declarative solutions. The candidate has experience communicating solutions and design trade-offs to business stakeholders. The Application Architecture eBook covers the content needed for this certification.

The candidate has the experience and skills outlined below:

- Has 5+ years of delivery experience.
- Provides experienced guidance on the appropriate choice of platform technology.
- Is certified on Admin, Advanced Admin, Developer, or Platform App Builder.
- Understands architecture options, design trade-offs, and has the ability to communicate design choices.
- Is aware of globalization (multi-language, multi-currency) application design considerations on a project.
- Understands advanced Force.com data modeling concepts and best practices.
- Builds experienced solutions with Force.com declarative design elements.
- Understands the trade-offs of declarative vs. code and when you need to use each.



# Learn Materials

## General Resources

Here are some comprehensive general resources that are a good starting place for your self-paced study.

### [Build a Cloud App Tutorial](#)

Creating the foundation of a basic cloud app with Force.com requires just a few mouse clicks. In this tutorial, you use the *App Quick Start* wizard to create an app that can help you manage merchandise records in a warehouse.

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### [Salesforce1 Mobile App Developer Guide](#)

Salesforce1 is a mobile app development platform for everyone. It gives ISVs, developers, administrators, and every user the freedom to innovate.

This approach to unlocking mobile app development for organizations is built for today's needs: mobile and social solutions delivered in days or weeks. Apps are driven by metadata and intelligently provide context to the user experience. These apps deliver information-based mobile device features: addresses can be plotted on maps, phone numbers can be dialed with a simple tap, feed-centric workflows can be created, and much more.

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Please register in the Salesforce Success Community and join our Architect Success group [here](#).



## General Overview

The following pages will introduce you to various focuses within the Application Architecture domain. You will be introduced to relevant objectives that require a very specific set of skills and the curated learning materials that will help you to achieve them.

- Workflow and Process
- Formulas
- General Architecture
- Files and Social
- Localization / Global Deployments

Each learning resource has a related skill level: **Beginner**, **Intermediate**, or **Advanced**. Resources marked **Core** cover essential concepts, while those marked **Recommended** provide additional materials for further edification.



## 1. Workflow and Process

This objective covers the various technologies and methodologies involved with implementing automated workflow and business processes on the Force.com and Salesforce1 platform. These technologies include Visual Workflow, Salesforce Actions, Lightning Process Builder, Approval Processes, Workflow Rules, and Workflow Actions (Email Alerts, Field Updates, Outbound Messages, Flow Triggers and Workflow Apex).

### 1.1 Describe the use of the workflow capabilities (rules, tasks, emails, field updates, approvals) within a solution.

#### [Workflow: Automating the Process](#)

This PDF provides instructions on how to set up Workflow tasks and email alerts. It also helps you define Field Updates, Outbound Messages, and Flow Triggers.

**Tags: Beginner, Recommended**

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#### [Which Automation Tool Should I Use?](#)

Salesforce provides multiple tools to automate your organization's repetitive business processes: Approvals, Process Builder, Workflow, and Visual Workflow.

**Tags: Beginner, Recommended**

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#### [Hands-on Training: Streamline Requests with Approval Processes](#)

This 60-minute video shows you how to create a multi-step approval process to ensure that records receive proper approval.

**Tags: Intermediate, Core**

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#### [Getting Started with Approval Processes](#)

This webpage houses a checklist on preparing the appropriate information before creating your approval process.

**Tags: Intermediate, Recommended**

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## [General Workflow and Approvals Limits](#)

Edition limits for workflow rules and approval processes.

**Tags: Advanced, Recommended**

## 1.2 Describe the use of visual workflow along with the limitations and considerations of a visual workflow solution.

### [Visual Workflow: Cloud Flow Designer Overview](#)

This short video offers an overview of the Cloud Flow Designer.

**Tags: Beginner, Core**

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### [Trailhead: Collect Information from Users and then Operate on It with Visual Workflow](#)

This Trailhead unit provides an introduction to many of the features in Visual Workflow.

**Tags: Beginner, Recommended**

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### [Increase Productivity with Visual Workflow](#)

Learn how to automate complex business processes with Visual Workflow. Discover how to build flows that guide users through the process of collecting and updating data in Salesforce.

**Tags: Intermediate, Recommended**

## 1.3 Describe the capabilities and limitations of Salesforce Actions.

### [Quick Actions Implementations Guide](#)

After an introduction to object- and field-level security, this article looks at the different techniques that Force.com applications can use to enforce a customer's security settings.

**Tags: Beginner, Core**





## 1.4 Describe the use of Lightning Process Builder in a solution that previously required code, along with the limitations.

### [Lightning FAQ](#)

This is a general FAQ regarding Salesforce Lightning.

**Tags: Beginner, Core**

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### [Salesforce1 Lightning App Builder Demo](#)

This short video gives a broad introduction to how the Salesforce1 Platform helps you build apps faster than ever.

**Tags: Beginner, Recommended**

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### [Trailhead: Getting Started with the Lightning App Builder](#)

After completing this unit, you'll be able to understand how the Lightning App Builder can help you build responsive apps that display on any device, as well as custom pages for Lightning Experience.

**Tags: Beginner, Recommended**

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### [Lightning Process Builder Overview](#)

The Process Builder is a workflow tool that helps you easily automate your business processes by providing a powerful and user-friendly graphical representation of your process as you build it.

**Tags: Intermediate, Core**

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### [Trailhead: Lightning Components Quick Start](#)

8-step Quick Start that allows you to start using Lightning components.

**Tags: Intermediate, Core**

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### [Access External Data in Real-time with Lightning Connect](#)

Lightning Connect lets you seamlessly access data from external sources, side-by-side with your Salesforce data. You can pull data from legacy systems such as SAP, Microsoft and Oracle in real time, without making a copy of the data in Salesforce.

**Tags: Intermediate, Recommended**

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### [Lightning Components Developer's Guide](#)

This guide will provide you with an in-depth resource to help you create your own stand-alone Lightning apps, as well as custom Lightning components that can be used in the Salesforce1 mobile app.

**Tags: Advanced, Core**

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RESOURCE:



See "Suggested Activities" later in this document.



## 2. Formulas

This objective covers advanced formula functionality on the Force.com platform and leveraging Custom Settings within a declarative framework.

### 2.1 Utilize advanced formula features (VLOOKUP, roll-up summary, image, x-object) and describe capabilities and limitations.

#### [An Introduction to Formulas](#)

This article introduces formulas on Force.com. It also provides an overview of the syntax for formulas and the operations that are available in formulas.

**Tags: Beginner, Core**

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#### [Trailhead: Introduction to Roll-Up Summary Fields](#)

After completing this unit, you will be able to create a roll-up summary field and apply field-level security to your roll-up summary field.

**Tags: Beginner, Core**

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#### [Cheat Sheets](#)

This webpage provides a useful list of cheat sheets, which are concise, quick references to various technologies summarizing the most important aspects in a compact, searchable, and printable form.

**Tags: Beginner, Recommended**

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#### [Examples of Advanced Formula Fields](#)

This webpage provides a bulleted list of advanced formula fields.

**Tags: Intermediate, Recommended**

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## 2.2 Describe the use of hierarchical custom settings in a declarative solution.

### [Custom Settings](#)

This article defines the two types of custom settings and provides instructions on how to create and manage them as well.

**Tags: Intermediate, Core**

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### [Salesforce Limits Quick Reference Guide](#)

This guide provides commonly referenced limits for Salesforce. This guide may not cover all limits or may contain limits that don't apply to your organization. Stated limits aren't a promise that the specified resource is available at its limit in all circumstances.

**Tags: Advanced, Recommended**

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RESOURCE:



See “Suggested Activities” later in this document.



## 3. General Architecture

This objective covers considerations, benefits and trade-offs on topics including architectural optimization, declarative vs. programmatic methodology, org planning, licensing, data modeling, reporting and analytics, and external applications.

### 3.1 Describe how to architect a solution for optimal performance, scalability, usability, and maintenance.

#### [The Force.com Multitenant Architecture](#)

This paper explains the technology that makes the Force.com platform fast, scalable, and secure for any type of application.

**Tags: Beginner, Core**

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#### [Query and Search Optimization Cheat Sheet](#)

When building queries, list views, and reports, it's best to create filter conditions that are selective, so Force.com scans only the rows necessary in the objects your queries target. The Force.com query optimizer doesn't use an index to drive queries containing unselective filter conditions, even if the fields those filter conditions reference already have indexes on them.

**Tags: Beginner, Core**

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#### [Inefficient Related Lists](#)

Read this article for suggestions on how to improve your pages and provide the right kind of related list information.

**Tags: Intermediate, Core**

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### [Force.com Formula Fields, Indexes, and Performance Gotchas](#)

This blog post gives you an edge in building applications that perform well, especially when your organization has a large volume of data.

**Tags: Intermediate, Core**

### [Managing Lookup Skew in Salesforce to Avoid Record Lock Exceptions](#)

Read this blog post to learn both how lookup skew affects objects with large volumes of data and what you can do now to minimize its effects.

**Tags: Advanced, Recommended**

## 3.2. Describe the appropriate combination of declarative and programmatic functionality used within a solution.

### [Architecting Force.com Apps: A Design Primer](#)

In this article, you'll get a broad introduction to many of the key concepts you'll need to understand before you begin designing apps that leverage the power of the Force.com cloud application platform.

**Tags: Beginner, Core**

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### [Visual Development - When to Click Instead of Write Code](#)

Find out what you can (and should) do with clicks instead of writing code.

**Tags: Intermediate, Core**

## 3.3. Describe the architectural considerations when org planning and defining a single- or multi-org strategy.

### [Enterprise Architecture: Single-org versus Multi-org Strategy](#)

Here are the 12 questions to ask your clients in order to make a recommendation regarding the most appropriate org strategy.

**Tags: Intermediate, Core**



### 3.4. Describe the capabilities and constraints of license types, and design a solution taking best practices into consideration.

#### [User Licenses Overview](#)

This article gives a broad overview of the various license types and their related permission sets.

**Tags: Beginner, Core**

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#### [Salesforce Features and Edition Limits](#)

Limits for Salesforce features by edition.

**Tags: Advanced, Recommended**

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### 3.5. Describe data modeling concepts and implications of database design and modeling.

#### [Considerations for Relationships](#)

This paper explains the technology that makes the Force.com platform fast, scalable, and secure for any type of application.

**Tags: Beginner, Core**

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#### [Creating a Many-to-Many Relationship](#)

This step-by-step tutorial demonstrates how to create a many-to-many relationship, which allows each record of one object to be linked to multiple records from another object, and vice versa.

**Tags: Beginner, Recommended**

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### 3.6. Describe the design and platform considerations, trade-offs, and risks for reporting and analytics.

[Designing Dashboards and Reports for Force.com Implementations with Large Data Volumes](#)

This blog post will give you an overview of how to design reports for large data volumes (LDV).

**Tags: Intermediate, Core**

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[Improve Report Performance](#)

This webpage offers quick tips on how to make your reports run faster.

**Tags: Intermediate, Recommended**

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### 3.7. Describe the benefits, considerations, and trade-offs of incorporating external applications into an application architecture.

[Salesforce AppExchange](#)

AppExchange apps eliminate risk and save time by helping you find the best tools that integrate with Salesforce and increase your team's productivity and company's growth.

**Tags: Beginner, Core**

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[Integration Patterns and Practices](#)

This document describes strategies (in the form of patterns) for these common integration scenarios. Each pattern describes the design and approach for a particular scenario rather than a specific implementation.

**Tags: Intermediate, Recommended**

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### [Trailhead: Salesforce Connect](#)

Access, display, and integrate data from an external data source in real time.

**Tags: Advanced, Recommended**

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## 4. Files and Social

This objective covers the various options for managing files, including Chatter Files, Attachments, Content, and Knowledge. It also cover the Social functionality of the Force.com platform, including Twitter, Facebook, LinkedIn, etc.

### 4.1 Describe the platform capabilities and techniques for managing files and content, including Chatter Files, Attachments, Content, and Knowledge.

[Differences between Files, Salesforce CRM Content, Salesforce Knowledge, Documents, and Attachments](#)

This is a one page chart that spells out the differences between Files, CRM Content, Knowledge, Documents, and Attachments.

**Tags: Beginner, Core**

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[The Files Connect Setup Process](#)

With Files Connect, Salesforce users can access, share, and search external data from systems like Google Drive or SharePoint. The setup process differs for cloud-based and on-premises external data sources.

**Tags: Beginner, Recommended**

### 4.2 Describe the benefits of the social capabilities of the platform and how they can be incorporated into a solution.

[Social Accounts, Contacts, and Leads Overview](#)

This article will help you increase your users' access to social intelligence and serve current and potential customers better with easy access to social networking within Salesforce.

**Tags: Beginner, Core**



## 5. Localization / Global Deployments

This objective reviews the functionality associated with global deployments, including Salesforce capabilities and limitations in localizing the application for language, currency, etc.

### 5.1 Describe the capabilities and limitations of the platform's internationalization functionalities.

#### [International Organizations: Using Multiple Currencies](#)

This PDF walks through a scenario that demonstrates how an international division can track, forecast, and report on opportunities in local currencies, while providing company-wide reporting and forecasting in a single common currency.

**Tags: Beginner, Core**

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#### [Setting Up the Translation Workbench](#)

The Translation Workbench filters your customizations so your translators can translate in one interface. You can also track changes to translated customizations and override translations from managed packages.

**Tags: Intermediate, Core**



See “Suggested Activities” later in this document.



## Suggested Activities

To practice these activities, you may do one of the following:

- Request a free Practice Org by creating a case [here](#).
  - Question Type: Architect Support
  - Question Detail: Request Practice Org

You should receive login information in about two business days.

- Use your existing Developer org.
- Sign up for a free Developer Edition account [here](#).

### 1. Visual Workflow

1. Before you dive into this activity, make sure that you have:

- Signed up for a Developer Edition organization
- Installed the enhanced Warehouse data model

This exercise will give you hands-on training for creating a basic Visual Workflow.

Step 1: Add a screen element to capture user's region.

Step 2: Add and configure a Decision Element.

Step 3: Add a screen element for the Americas option.

Step 4: Add a screen element for the EMEA option.

Step 5: Collect commute information.

Step 6: Collect email address.

Step 7: Thank the respondents.

Step 8: Save the flow.

Step 9: Run the flow.

For reference, please refer to the [Trailhead: Collect Information from Users and then Operate on It with Visual Workflow](#).

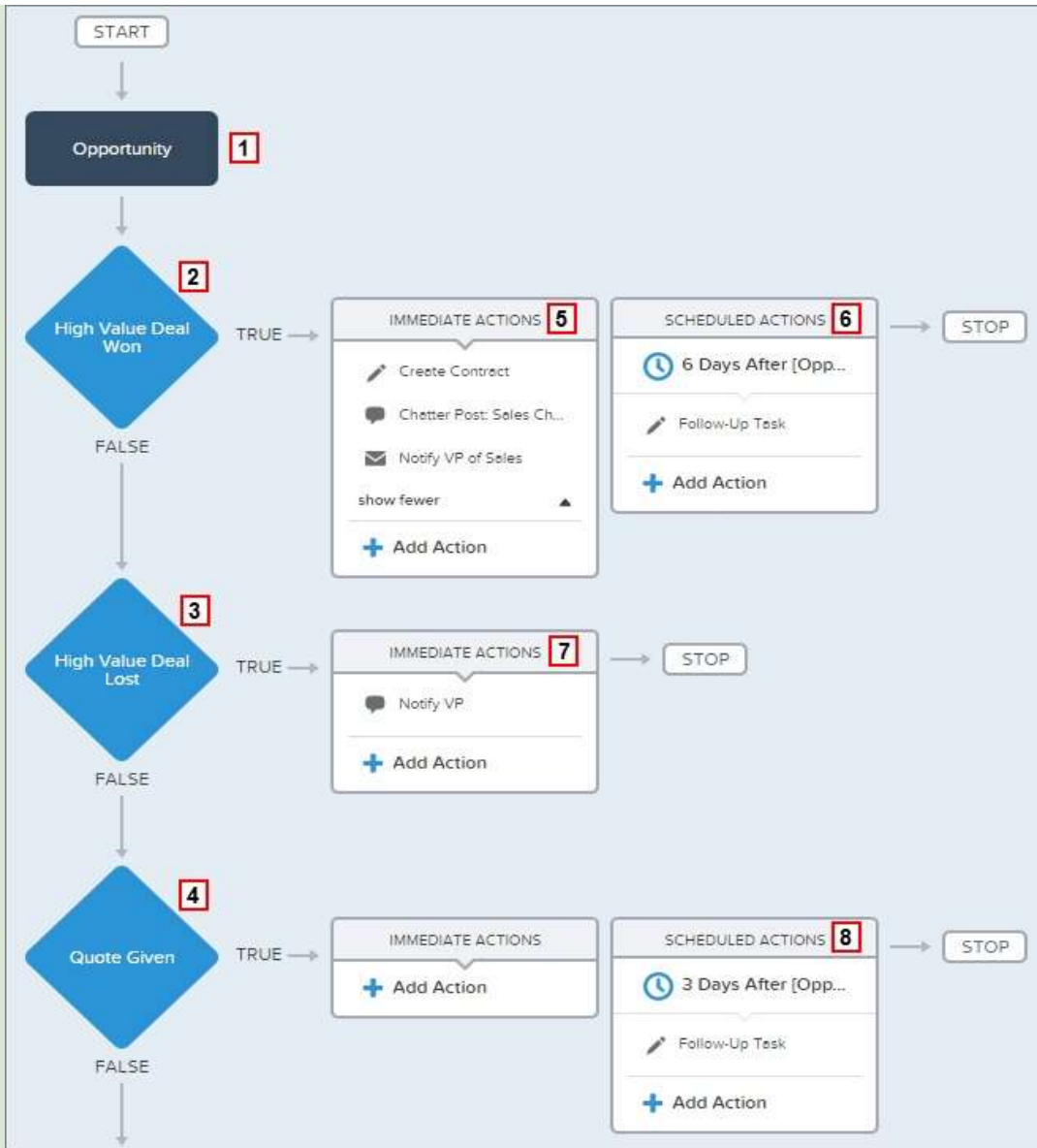


## 2. Opportunity Management

You can use the Process Builder to automate a single process by adding multiple groups of criteria and then associating individual actions with those criteria.

1. In this example, the process is defined to start when an opportunity record is created or edited.
2. Three criteria nodes are then set up to check whether a high-value deal was:
  - won
  - lost
  - or a quote was given

The High Value Deal Won criteria checks whether the opportunity's stage is closed and won and also whether the opportunity's amount is greater than \$1,000,000.00. If both of these conditions are met, the associated action group is executed. For this criteria node, three immediate actions and one scheduled action are defined.



If neither of the previous criteria conditions are met, the next criteria node defined in this process checks whether the opportunity stage is set to “Proposal/Quote Given.” If this condition is true, a scheduled action is executed three days after the record is updated. The scheduled action creates a follow-up task for the opportunity owner to make a call to inquire about the opportunity.

For reference, please this [resource](#).



### 3. Creating a Suggestion Box App

In this Trailhead [project](#), you learn how to build an application on App Cloud from start to finish, without writing any code.



# Build Materials

## 1. Opportunity Locking

1.1 Describe the use of the workflow capabilities (rules, tasks, emails, field updates, approvals) within a solution.

### Use Case

The customer, Universal Containers, would like to lock all opportunity fields and the products related list after an opportunity is closed to ensure that opportunity data and reports are as accurate as possible.

### Detailed Requirements

- Lock all opportunity fields immediately upon close (Stage is either “Closed Won” or “Closed Lost”) for all users except the opportunity owner and the administrator.
- No products can be added, deleted, or updated after it is moved to closed and no opportunity line item fields (e.g., Quantity, Sales Price) can change either.
- The opportunity owner can change the Description field for seven days but cannot change any other field in that time period.
- After seven days, all fields become locked.
- Administrator profile users have no restrictions to editing.

### Prerequisite Setup Steps

N/A

### Considerations

Once an opportunity’s stage is set to “Closed Won” or “Closed Lost,” consider the following:

1. Can the stage be changed back to an open stage, which would allow fields to be edited?
2. Can the Close Date be changed after moving the stage to “Closed Won”?
3. Can products be deleted or edited?
4. Can the amount field on the product be changed?
5. Can the opportunity owner still edit the description field, but no other fields?
6. Can a person who does not own the opportunity and is not an administrator update the description field?
7. When a user adds a new opportunity, can the “Locked Opportunity” record type be selected?
8. When logging in as an Administrator, are there any restrictions?





## Solution

### Best Solution Overview

- Overall, a good solution is to use a “Locked” checkbox field that is set by a Workflow Rule & Field Update when an opportunity is moved to “Closed Won” or “Closed Lost.” Validation Rules are also used to prevent a user from saving a record after a user has updated opportunity fields or Opportunity Product records or fields.
- A combination of Record Type and Page Layout can also be used to enhance the user experience by not allowing a user to change a field in the first place, but this does not work with some standard fields (e.g., Name, Currency, Closed Date, Stage, Forecast Category) and related lists (e.g., Opportunity Products).

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### Considerations Solutions:

1. Why use a custom Close Date (Locked Date) instead of the standard Close Date?
  - a. While the opportunity is open, the user can set the opportunity Close Date to any date. When setting the opportunity Stage to Closed Won, the Close Date gets set to the current date. When setting the Stage to Closed Lost, it is not changed to the current date, which will affect the 7-day requirement.
2. Why use an opportunity “Locked” field?
  - a. The other option is to have validation rules for each field that is editable. By using a “Locked” field, only one validation rule is needed per object (Opportunity, Opportunity Product).
3. Can Workflow, Record Types, and Page Layouts alone solve the solution?
  - a. No, because there are some standard fields on the opportunity record (e.g., Name, Currency, Closed Date, Stage, Forecast Category) that cannot be set to Read Only on a page layout.
  - b. This will not work for the Opportunity Products related list.
4. What are some impacts to the User experience that should be considered?
  - a. When using validation rules alone, a user will be able to update a field, and then they will get an error message after the record is saved.
  - b. When using validation rules with Record Types and Page Layouts, some fields will not be updateable, which is ideal, but there will still be some fields that can be updated and prevented from change only after saving.



5. Why not just remove the “Add Product” and “Edit All” buttons from the Opportunity Product related list in the Locked Opportunity page layout?
  - a. By removing these buttons, an administrator will not be able to update products after the record has been locked.

### Solution Description:

1. Custom fields: Opportunity Locked field (checkbox), Opportunity Locked Date field
2. Validation Rules: One for Opportunity and one for Opportunity Product; it should evaluate who the user is (System Admin vs. Owner vs. anyone else), the locked date and the field being updated
3. Workflow Rules: When Opportunity becomes Closed Won or Closed Lost, then trigger Field Updates
4. Workflow Field Updates: Locked checkbox gets checked, Opportunity Locked Date is set to present date (may not be the same as the actual Close Date if the close is done several days later) and Opportunity Record Type
5. Record types: One for standard, one for “Locked” set by a Workflow Field Update
6. Page layouts: One for standard, one for “Locked” (all fields marked as read-only where allowed)

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### Detailed Solution:

#### 1. Add opportunity Record Type.

- Name = e.g., Opportunity Locked
- Do not Enable for Profiles (we do not want users to be able to select this RecordType when creating new Opportunities)

#### 2. Add opportunity Field.

- Name = e.g., Locked
- Type = Checkbox
- Read Only

#### 3. Add another opportunity Field.

- Name = e.g., Locked Date
- Type = Date
- Read Only



#### 4. Add opportunity Page Layout.

- Copy Opportunity Layout
- Name = e.g., Opportunity Locked
- Make all fields Read-only:
  - Except for Description
  - Use validation rules for all other exceptions
- Associate Layout to the "Locked Opportunity" Record Type

#### 5. Add Workflow Rule (Opportunity Object).

- Evaluation Criteria:
  - Evaluate the rule when a record is "created, and any time it's edited to subsequently meet the criteria"
  - Note: if an administrator re-opens an Opportunity, we want the rule to be re-evaluated if it is set to Closed again
- Run this rule if the following "criteria are met"
  - Rule Criteria: Opportunity: StageEQUALSClosed Won,Closed Lost
- Workflow Actions (Opportunity Object)
  - Field To Update: Opportunity Record Type; field value "Opportunity Locked"
  - Field To Update: Locked; field value "true"
  - Field To Update: Locked Date; field value formula: Today()

#### 6. Validation Rule (Opportunity).

- Rule Name = e.g., Opportunity\_Locked
- Error Condition Formula (example):
  - /\*1. If any field except Description is changed, then only Admin can update the field\*/  
(NOT(ISCHANGED( Description )) && Locked\_\_c = true && \$Profile.Name <> "System Administrator") ||
  - /\*2. If Description is changed and Locked Date is less than 7, then only allow opportunity owner and Admin to change all fields\*/  
(ISCHANGED( Description ) && (Today() - Locked\_Date\_\_c < 7) && Owner.Id <> \$User.Id && \$Profile.Name <> "System Administrator")||
  - /\*3. If Description is changed and Locked Date is greater than 7, then only allow Admin to change the Description field\*/  
(ISCHANGED( Description ) && (Today() - Locked\_Date\_\_c > 7) && \$Profile.Name <> "System Administrator")
- Error Message = e.g., Record is locked when the opportunity is closed.

#### 7. Validation Rule (Opportunity Products).

- Rule Name = e.g., Opportunity\_Product\_Locked
- Opportunity.Locked\_\_c = true && \$Profile.Name <> 'System Administrator'
  - Error Message = e.g., Record is locked when the opportunity is closed.



## 2. Process Automation Using Lightning Process Builder

- 1.4 Describe the use of Lightning Process Builder in a solution that previously required code, along with the limitations.

### Use Case

Universal Containers has a sales operations team that monitors high-value deals and handles various follow-ups, including quoting follow-up, contract creation, internal notifications, scheduling "lessons learned" meetings, and creating follow-up tasks. As their business has grown exponentially, they have found it extremely challenging to keep up with their backlog and are in desperate need of a more automated approach.

### Detailed Requirements

#### 1. If a high-value deal becomes Closed and Won:

- a. Unless the associated account is already a customer, update a checkbox to indicate the account is a customer and indicate the Year Started is the current year.
- b. Create a draft contract record with the same name as the opportunity that's associated with the opportunity's account. It should start 30 days after the opportunity close date.
- c. Congratulate the opportunity owner for closing and winning the opportunity by posting to the entire (company-wide) sales team.
- d. Schedule a follow-up task ("Contract Follow-up") for the associated account's owner to be created 7 days after the opportunity's Close Date, due one week later.

#### 2. If a high-value deal becomes Closed and Lost:

- a. Set the Reason Lost to Price.
- b. Notify the Sales Rep's manager's manager on the deal, including the opportunity name and amount that was lost. It's important that others with access to the Opportunity be able to comment on this as well.

#### 3. If a Quote is given for a high-value deal:

- a. Create a follow-up task ("Quote Follow-up") due 10 days from the current day. It should be assigned to the opportunity owner.



## Assumptions

1. A high-value deal is considered to be an opportunity whose amount is  $\geq$  \$5,000,000.
2. Quote given means the Opportunity Stage = Proposal/Price Quote.
3. If the first condition (1) isn't met, go to the next one (2), and so on.
4. The actions above should only occur (once) when the appropriate conditions are met (and previously weren't met). However, there may be other automated workflows in place that could make the deal meet any of the requirements indicated above.

## Prerequisite Setup Steps

1. Ensure there is a Sales Process assigned to several Opportunity Stage values, including "Proposal/Price Quote" (this should not be the default picklist value).
2. Create a custom Account field called IsCustomer with a default value of False.

## Considerations

1. Will workflow rules potentially conflict with the Lightning process and, if so, how would you mitigate this?
2. What features are necessary to meet the requirements that a Lightning Process supports that Workflow Rules do not?
3. What if you or your customer is just more comfortable using Workflow Rules?
4. What is the difference between Criteria on an Action Group versus individual Action?
5. When do you use Immediate versus Scheduled Actions?
6. How can you monitor the execution of the Process?



## Solution

### Best Solution Overview

Using the Process Builder, we've combined three criteria nodes and associated actions into a single, automated process. To automate the same business process with workflow, you would have to create three different workflow rules and use Apex triggers to create the contract record and post to the Sales Chatter group.

---

### Considerations/Solutions:

1. Will workflow rules potentially conflict with the Lightning process and, if so, how would you mitigate this?
  - a. If you create processes to replace any workflow rules, make sure you delete or deactivate those workflow rules when you activate the equivalent processes. Otherwise, both workflow rules and processes will fire and cause unexpected results, such as overwritten records or redundant email messages.
  - b. Also, you can also consider using Recursion in the Lightning process (Advanced option on the object). This will help to ensure that the process can execute up to 5 times within a single transaction (due to some other process, workflow rule, or flow updating the record in the same transaction).
2. What features are necessary to meet the requirements that a Lightning Process supports that Workflow Rules do not?
  - a. Create your whole process in one place. Create a record, post to Chatter.
3. What if you or your customer is just more comfortable using Workflow Rules?
  - a. Workflow Rules are supported for now, but will eventually be replaced by Lightning Processes (refer to last paragraph):  
[https://developer.salesforce.com/page/Lightning\\_Process\\_Builder](https://developer.salesforce.com/page/Lightning_Process_Builder)
4. What is the difference between criteria on an Action Group versus individual Action?
  - a. The criteria on an Action Group determines when to fire all actions in the group, while an individual Action can have criteria only applicable to the single Action.



5. When do you use Immediate versus Scheduled Actions?
    - a. Immediate Actions should be used any time they must be triggered as soon as its parent Action Group conditions are met.
    - b. Scheduled Actions should be used any time the conditions are met for an Action Group but a Time Lapse (delay) is required until the desired Action is triggered.
  6. How can you monitor the execution of the process?
    - a. [https://help.salesforce.com/HTViewHelpDoc?id=process\\_troubleshoot.htm&language=en\\_US](https://help.salesforce.com/HTViewHelpDoc?id=process_troubleshoot.htm&language=en_US)
- 

### Solution Description:

1. Create a Process using Lightning Process Builder on the Opportunity Object.
  2. Add three Action Groups.
  3. Add Update and Insert Actions to the Action Group as appropriate.
  4. Set Actions as Immediate or Scheduled as appropriate.
- 

### Detailed Solution:

#### 1. Create a Process using Lightning Process Builder on the Opportunity Object.

- a. Start the process when a record is created or edited.
- b. Select the Recursion option under Advanced.

#### 2. Add an Action Group (Won).

- a. Criteria for Executing Actions: Conditions are met
- b. Condition #1
  - Field: [Opportunity].StageName
  - Operator: Equals
  - Type: Picklist
  - Value: Closed Won
- c. Condition #2
  - Field: [Opportunity].Amount
  - Operator: Greater than or equal
  - Value: \$5,000,000.00
- d. Conditions: All of the conditions are met (AND)
- e. Do you want to execute the actions only when the specified changes are made to the record? Yes

#### 3. Add an Action Group (Lost).

- a. Criteria for Executing Actions: Conditions are met
  - b. Condition #1
-



- Field: [Opportunity].StageName
  - Operator: Equals
  - Type: Picklist
  - Value: Closed Lost
- c. Condition #2
- Field: [Opportunity].Amount
  - Operator: Greater than or equal
  - Type: Currency
  - Value: \$5,000,000.00
- d. Conditions: All of the conditions are met (AND)
- e. Do you want to execute the actions only when the specified changes are made to the record? Yes

#### 4. Add an Action Group (Quote Given).

- a. Criteria for Executing Actions: Conditions are met
- b. Condition #1
- Field: [Opportunity].StageName
  - Operator: Equals
  - Type: Picklist
  - Value: Proposal/Quote
- c. Conditions: All of the conditions are met (AND)
- d. Do you want to execute the actions only when the specified changes are made to the record? Yes

#### 5. Add Actions to the Won Action Group.

1. Immediate Actions
- Action #1 (Update Account to Customer)
    - Action Type: Update a Record
    - Action Name: Update Account to Customer
    - Record Type: Select the Opportunity record that started your process
    - Criteria for Updating Records: Updated records meet all conditions
    - Condition #1
      - Field: IsCustomer
      - Operator: Equals
      - Type: Boolean
      - Value: False
    - New Field Value #1
      - Field: IsCustomer
      - Type: Boolean
      - Value: True
    - New Field Value #2
      - Field: Year Started
      - Type: Formula
      - Value: TEXT(YEAR(TODAY()))





- Action #2 (Insert Draft Contract)
  - Action Type: Create a Record
  - Action Name: Insert Draft Contract
  - Record Type: Contract
  - New Field Value #1
    - Field: Account ID
    - Type: Reference
    - Value: [Opportunity].AccountId
  - New Field Value #2
    - Field: Description
    - Type: Reference
    - Value: [Opportunity].Name
  - New Field Value #3
    - Field: Contract Start Date
    - Type: Formula
    - Value: [Opportunity].CloseDate + 30
  - New Field Value #4
    - Field: Status
    - Type: Picklist
    - Value: Picklist
- Action #3 (Post to Sales group)
  - Action Type: Post to Chatter
  - Action Name: Post to Sales Group
  - Post to: Chatter Group
  - Group: Sales Strategy (or the relevant group name)
  - Message: Congratulations {![Opportunity].OwnerId} for closing and winning the following opportunity: {![Opportunity].Name}!!!

## 2. Scheduled Actions

- Set Time for Actions to Execute: 7 Days After [Opportunity].CloseDate
- Action #1 (Create Follow-up Task)
  - Action Type: Quick Actions
  - Action Name: Create Follow-up Task
  - Filter Search By: Global actions
  - Type: Create a Record
  - Action: NewTask
  - New Quick Action Field Value #1
    - Field: Assigned To ID
    - Type: Reference
    - Value: [Opportunity].OwnerId
  - New Quick Action Field Value #2
    - Field: Due Date Only
    - Type: Formula
    - Value: [Opportunity].CloseDate + 14
  - New Quick Action Field Value #3



- Field: Subject
- Type: String
- Value: Contract Follow-up

## 6. Add Actions to the Lost Action Group.

### 1. Immediate Actions

- **Action #1 (Add Reason Lost)**
  - Action Type: Update a Record
  - Action Name: Add Reason Lost
  - Record Type: Select the Opportunity record that started your process
  - Criteria for Updating Records: No criteria-just update the records!
  - New Field Value #1
    - Field: Reason\_Lost\_\_c
    - Type: Picklist
    - Value: Price
- **Action #2 (Post to Sales group)**
  - Action Type: Post to Chatter
  - Action Name: Post to This Record
  - Message: {[Opportunity].Owner.ManagerId} The following opportunity has been lost:  
  
Name: {[Opportunity].Name}  
Amount: {[Opportunity].Amount}

## 7. Add Actions to the Quote Given Action Group.

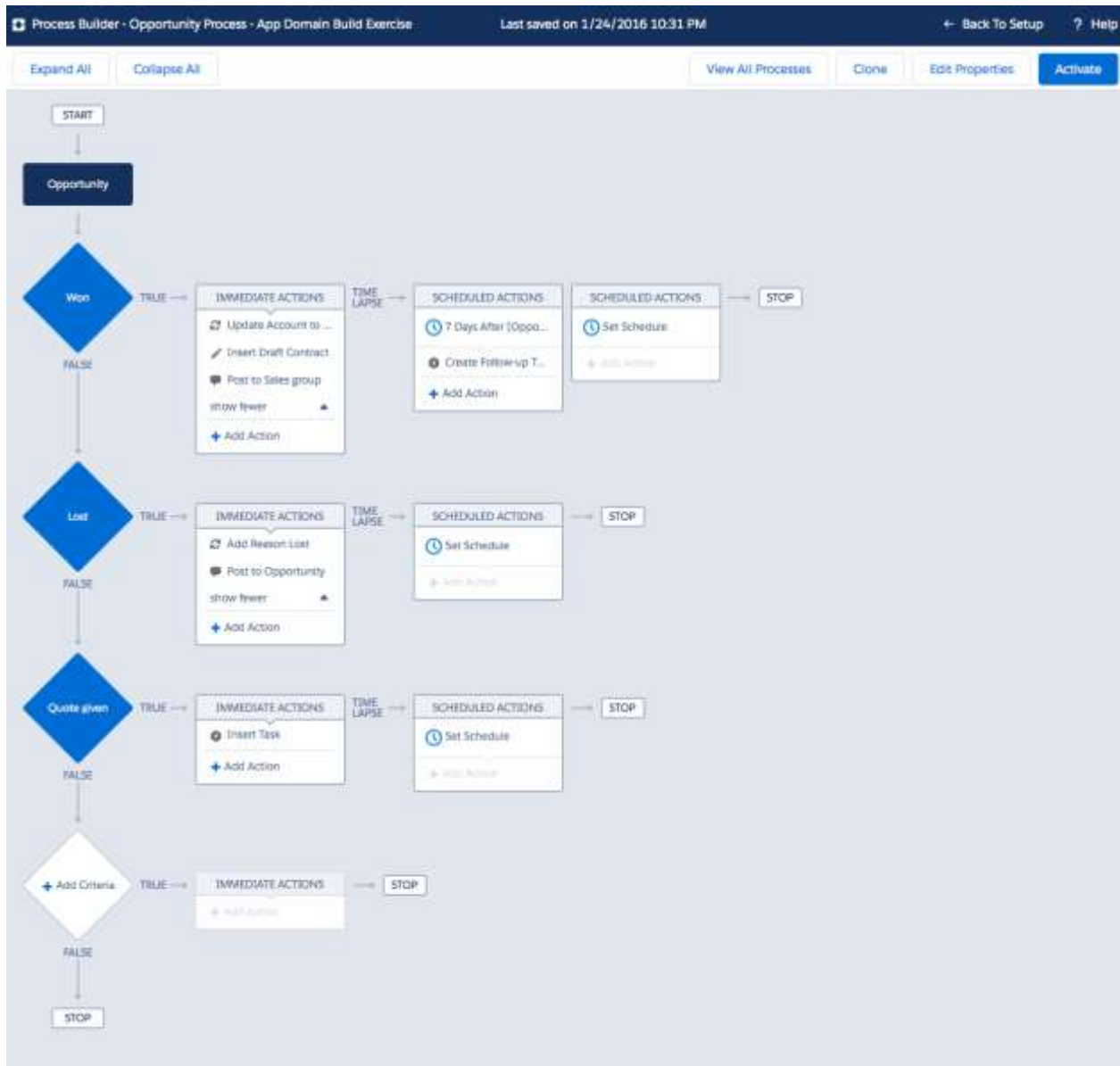
### 1. Immediate Actions

- **Action #1 (Insert Task)**
  - Action Type: Quick Actions
  - Action Name: Insert Task
  - Filter Search By: Global actions
  - Type: Create a Record
  - Action: NewTask
  - New Quick Action Field Value #1
    - Field: Assigned To ID
    - Type: Reference
    - Value: [Opportunity].OwnerId
  - New Quick Action Field Value #2
    - Field: Subject
    - Type: String
    - Value: Quote Follow-up



- New Quick Action Field Value #3
  - Field: Due Date Only
  - Type: Formula
  - Value: TODAY() + 10

## Solution Process (Visual):





## 3. Custom Links

2.1 Utilize advanced formula features (VLOOKUP, rollup summary, image, x-object) and describe capabilities and limitations.

### Use Case

Universal Containers would like to easily be able to see a summary of opportunities from any account record for all accounts in an account hierarchy. Build a solution to meet these requirements.

### Detailed Requirements

- When user is on Account Details page, provide a new link.
- This link should be called Opportunities Summary.
- Clicking on this link should show users a summary of opportunities.
- Summary should be for all accounts in that account hierarchy.
- This includes all accounts with the same parent, plus the parent itself.
- User should be able to pull this summary from any account record.

### Prerequisite Setup Steps

N/A

### Considerations

Once the user is on the Account details consider the following:

1. Can this be a button or a custom link?
2. When a user clicks, does the solution work dynamically based on the record they are on?
3. Does it work from child records as well as parent records?
4. Will this perform well and be able to be maintained?
5. Is it possible to avoid a lot of customizations?



	Notes	Limitations / Caveats	Recommendations / Alternatives
<b>Design/ Build</b>	<b>Assumption:</b> Account depth will not exceed 5	<b>Limitations:</b> Hard-coded depth of account hierarchy traversal (currently supports 5 levels)	Use Apex and Recursion
<b>Ops</b>	Consider security settings for access to Report Folders	<ul style="list-style-type: none"> <li>▪ Initial Amount may be entered in error, and would be stored by Workflow – would need to manually edit stored value to override</li> <li>▪ Workflow Rule Field Updates occur after Validation Rules are consistent with Field Updates</li> <li>▪ Deals created prior to Workflow creation will not have an initial amount set</li> </ul>	Workflow Rules can be bypassed by Bulk Import



## Solution

### Best Solution Overview

Overall, a good solution is to use configuration only options.

A combination of Custom Formula Field and Report can be used to enhance the user experience by allowing quick access from record detail standard page layout.

### Considered Solutions

1. While Account is open, use a button versus a link to call a report with Account as parameter?
2. Add the button on the Opportunity related list in the page layout?
3. Replace current standard page layout with a VF page to be able calculate and render Opportunities Summary inline?

### Solution Description

1. Custom fields: Opportunity Summary field (link)
2. Page layouts: standard page layout
3. Report

Account formula field: You need to build a field on the account that is populated either with a workflow or potentially a formula (but including this field in other reports might cause the formula to be slow.) This field would calculate the top level parent (e.g., Account Root ID, Name). It would be populated with the parent Account name and the ID (if populated) or if not populated, it would contain the account information itself.

You would use this field in the report criteria and pass it into the report. The link should be on the account record.



Note: It won't work if you use an opportunity report with two blank criteria, for example, account name =, parent account = "OR'd" together and you pass the account name and the parent account name into the report. The reason is that for any account with the parent account blank, the report will return all opportunities for accounts whose parent account is blank. This isn't correct, since that could include completely unrelated opportunities where the parent account is blank.



Other considerations: Place a limit on the number of levels possible in a formula. You also should include the report link format, for example, with the pv0={your formula field} and explain how to create the report (accounts with oppty report), get the ID (also note that this ID will change when pushed to production), and lastly that report links currently don't work with the Lightning experience and format the report link.

## Detailed Solution

1. Add custom formula field(s) to the Account for Root level parent Name and ID.
2. Add custom formula fields to the Account page layout.
3. Create / clone Opportunities summary report.
4. Use Account parameter passed from the custom formula link as filter in the report.

## Formula Details

Here are the details of the two custom fields needed on Account: Account Root ID and Account Root (e.g., name):

1. Calculate Root Account ID:

```
1 IF(  
2   LEN(Parent.Name) < 1, Id,  
3   IF(  
4     LEN(Parent.Parent.Name) < 1, Parent.Id,  
5     IF(  
6       LEN(Parent.Parent.Parent.Name) < 1, Parent.Parent.Id,  
7       IF(  
8         LEN(Parent.Parent.Parent.Parent.Name) < 1,  
9         Parent.Parent.Parent.Id,  
10        IF(  
11          LEN(Parent.Parent.Parent.Parent.Parent.Name) < 1,  
12          Parent.Parent.Parent.Parent.Id,  
13          NULL  
14        )  
15      )  
16    )  
17  )
```

2. This calculates the Root Account name (For display), and renders it as a hyperlink to a parameterized report, passing the root account id as the parameter:



## Sample Code:

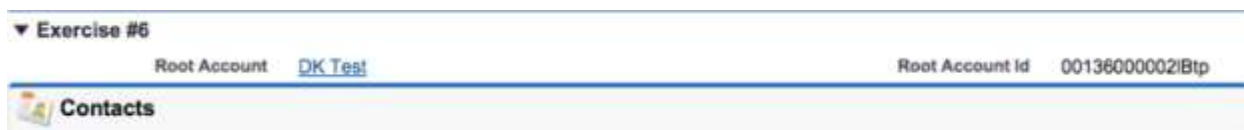
```
1 IF(
2   LEN(Parent.Name) < 1, HYPERLINK("/00036000000kNsj?pv0=" & Id, Name, "_parent"),
3   IF(
4     LEN(Parent.Parent.Name) <1, HYPERLINK("/00036000000kNsj?pv0=" &
5     Parent.Id,Parent.Name, "_parent"),
6     IF(
7       LEN(Parent.Parent.Parent.Name) < 1, HYPERLINK("/00036000000kNsj?pv0=" &
8       Parent.Parent.Id,Parent.Parent.Name, "_parent"),
9       IF(
10        LEN(Parent.Parent.Parent.Parent.Name) < 1,
11        HYPERLINK("/00036000000kNsj?pv0=" & Parent.Parent.Parent.Id,Parent.Parent.Parent.Name, "_parent"),
12        IF(
13          LEN(Parent.Parent.Parent.Parent.Parent.Name) < 1,
14          HYPERLINK("/00036000000kNsj?pv0=" & Parent.Parent.Parent.Parent.Id,
15          Parent.Parent.Parent.Parent.Name, "_parent"),
16          "Parent beyond 5 levels"
17        )
18      )
19    )
20  )
21 )
```

### NOTE:



NOTE: You need to replace “00036000000kNsj” with right Report ID specific to your org / sandboxes. Best practice would be to not hard code such IDs but that’s beyond the scope of this exercise.

Here is the output expected including the link to the report with parameter:







## Addendum Builds

### Cross Object Formula Field

Currently account status is displayed on the account with a custom field that indicates a status. In order to bring visibility to the account's status to the sales person working an opportunity, it's necessary to show the account status on the Opportunity field.

### Solution

1. Create a custom pick list field "Account Status" on the Account object with following values: Active, At Risk, Renewal Negotiations.
2. Load three images: one for green, yellow, and green traffic light.
3. Add a text formula field on Opportunity - "Account Status" to return the value of the account status in a green, yellow, or red traffic signal image depending for account status " as shown below:

```
1 IF( TEXT(Account.Status__c) = 'Active',  
    IMAGE("/servlet/servlet.FileDownload?file=01570000000Q6E1", "Green"), IF (  
    TEXT(Account.Status__c) = 'Renewal Negotiations',  
    IMAGE("/servlet/servlet.FileDownload?file=01570000000Q6Ef", "Yellow"),  
    IMAGE("/servlet/servlet.FileDownload?file=01570000000Q6Ep", "Red")))
```

4. Add the new formula field to the Opportunity page layout.

### Roll-Up Summary Fields

The account executive would like to display the sum of all open opportunity values for the current calendar year on the Account page.

### Solution

1. Create a roll-up summary custom field on the Account object called "Current Year Open Opportunities."
2. Set the field to summarize "Opportunities" and choose "Sum" for Roll-up type and use "Amount" as the field to aggregate. Use criteria of "Stage" not equal to "Close Won" and not equal to "Close Lost," Close Date equal to or greater than 1/1/2016 and Close Date less than 1/1/2017 to only return sum of open opportunity amounts for the calendar year.



Account Custom Field  
**Fiscal Year Opportunity Value**  
[Back to Account Fields](#) [Help for this Page](#)

**Custom Field Definition Detail** [Edit](#) [Set Field-Level Security](#) [View Field Accessibility](#)

**Field Information**

Field Label	Fiscal Year Opportunity Value	Object Name	Account
Field Name	Fiscal_Year_Opportunity_Value		
API Name	Fiscal_Year_Opportunity_Value__c		
Description			
Help Text			
Created By	Ajay-SysAdmin Kulkarni, 8/15/2016 2:07 PM	Modified By	Ajay-SysAdmin Kulkarni, 8/15/2016 2:11 PM

**Roll-Up Summary Options**

Data Type	Roll-Up Summary	Summary Type	SUM
Summarized Object	Opportunity		
Field to Aggregate	Opportunity.Amount		
Filter Criteria	(Stage NOT EQUAL TO Closed Won, Closed Lost) AND (Close Date LESS THAN 1/1/2017) AND (Close Date GREATER OR EQUAL 1/1/2016)		

This is a paragraph of placeholder text. It is only here to help show the layout of the page and how the text will flow. Replace this placeholder text with your own meaningful content.

## Use of a Custom Setting in a Formula Field

Sales users would like to view their annual sales quota on the Opportunity page and what percentage of the quota will be attained by each opportunity. The sales quota changes on the user's position in the organizational hierarchy and should be able to be set for each individual sales user.

### Solution

1. Add a custom setting "Sales Quota" of type Hierarchy and with "Public" visibility.
2. Add a field "Annual Sales Quota" of type currency to this setting.
3. Click on manage and set the organization value of 0 to be the default value.
4. Set higher values for specific users depending upon the organizational structure.
5. Create a custom formula field of type "percent" on opportunity to display the percent of annual sales quota attained by each opportunity for each sales user:

```
1 If ( $Setup.Sales_Quota__c.Annual_Sales_Quota__c > 0, Amount /$Setup.Sales_Quota__c.Annual_Sales_Quota__c,0)
```

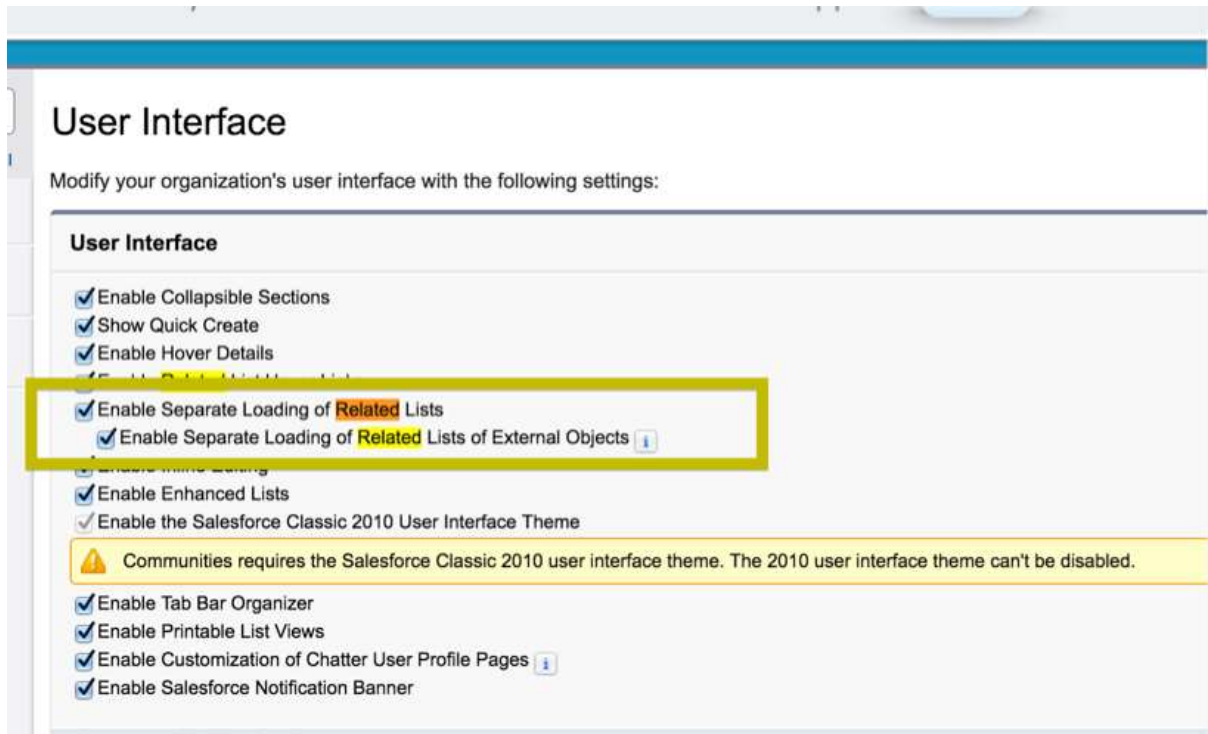
### Related Lists Loading Settings

Some of the users are complaining that the Account and Opportunity pages take a relatively long time to load especially when there are a lot of items related to the Account or Opportunity records. The team would like to investigate ways to improve the performance.



## Solution

1. Open an Account record with 30 Contacts, 20 Opportunities, and 100 Activity History related records and notice lag in opening up the record.
2. Update the Related Lists Loading Settings by following the menu path: **Setup > App Setup > Customize > User Interface** and click Enable Separate Loading of Related Lists of External Objects.



3. Open the same Account record before the change to the loading of related lists. You should notice performance improvement after settings are updated.

## Hyperlink Formula Field

The sales users would like to have a URL on the Opportunity page to an on-premise web application. The URL should pass the account name and the user's first and last name. The page layout shouldn't display the URL on screen, but instead should display the text "Account Report" for the URL.



## Solution

1. Create a custom formula field to return the hyperlink:  
Hyperlink('http://acme.com/accountreport.jsp?account='+ Name + '&FirstName='+ \$User.FirstName + '&LastName=' + \$User.LastName, 'View Account Report')
2. Add the new formula field to the Opportunity page layout.



## Request a Practice Org

To request a Practice Org that contains information from some of the Build Materials, please click [here](#) to open a case.

**Select Question Type:** Architect Support

**Question Detail:** Request Practice Org



ALERT: If you are not active within your Practice Org for 6 months, it may be deactivated.



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