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# Arrow Platform

## Quick Start Guide



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## UI Overview

Running 'Network Build' Plans

Running 'Network Analysis' Plans

Resource Managers

Quick Tips

Appendix

# Users interact with Arrow through controls located in three key areas of the screen: Header Bar, Visualizations Modal and Analysis Panel

The screenshot displays the Arrow software interface, which features a map of Boston as the central visualization. Three key interaction areas are highlighted with red boxes and numbered 1, 2, and 3.

**1 Header Bar**  
Key tools and shortcuts for creating new plans, opening existing ones, and adjusting global settings

**2 Visualizations Modal**  
Controls which data layers and features are displayed on the map

- 1. Locations
- 2. Network Equipment
- 3. Fibers
- 4. Copper
- 5. Conduits
- 6. Competition
- 7. Boundaries

**3 Analysis Panel**  
Used to adjusting key project, plan and optimization settings, and viewing optimization output

- 1. View Mode
- 2. Analysis Mode
- 3. Settings / Modeling Inputs

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UI Overview

**Running 'Network Build' Plans**


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Appendix

# We recommend the following order of operations for running optimizations

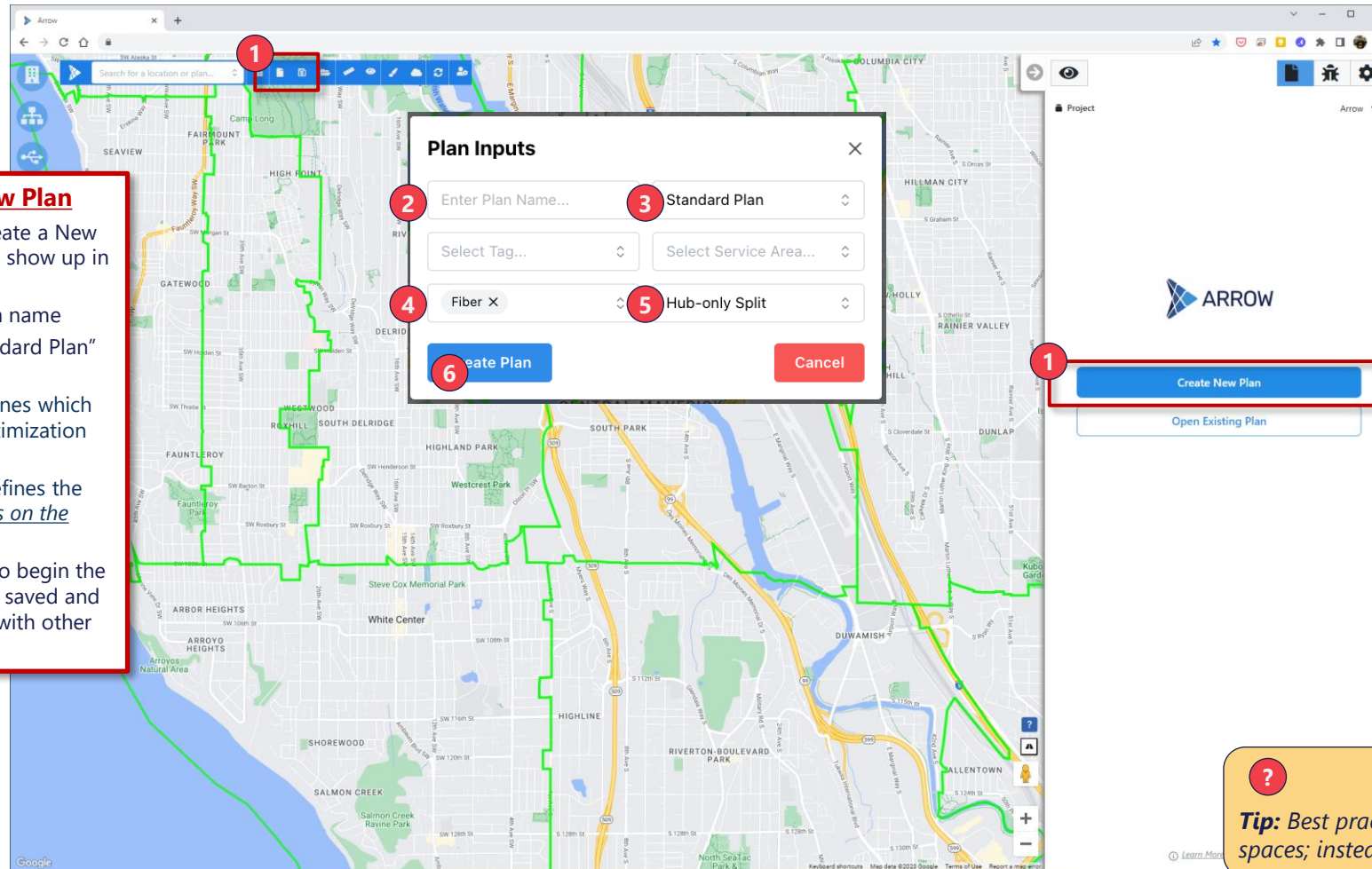
Order of Operations		Description
Set-Up	 <b>New Plan</b>	<b>Create a New Plan</b> <ul style="list-style-type: none"> <li>Before adjusting any settings or running simulations, please create a plan to store results for later reference</li> </ul>
	 <b>Settings</b>	<b>Adjust Data Sources and Plan Settings</b> <ul style="list-style-type: none"> <li>To ensure plans run with correct / most recent data, circuit locations, fiber routes, analysis areas, and build costs should be adjusted here</li> </ul>
	 <b>Locations</b>	<b>Select Location Types to be Used in the Run</b> <ul style="list-style-type: none"> <li>Users can turn on location layers to be used in simulations and to view on the map</li> <li>A plan will not run without a selection here</li> </ul>
	 <b>Input</b>	<b>Adjust Analysis Settings</b> <ul style="list-style-type: none"> <li>Configure build type and parameters, and financial assumption to best suit analysis goals</li> </ul>
	 <b>Equipment</b>	<b>Select Equipment to View on Map</b> <ul style="list-style-type: none"> <li>Users can turn on equipment layers to view on the map</li> <li>If existing fiber is loaded into the application, this layer can be turned on for viewing; it does not need to be turned on in order to be used in optimizations</li> </ul>
Results	 <b>Output</b>	<b>View Build and Financial Results</b> <ul style="list-style-type: none"> <li>Build (fiber miles, CapEx, locations connected) and financial (NPV, IRR, revenue, cash flow) outputs are easily accessible once a run is complete</li> </ul>

Notes: Before planning to use Arrow, make sure you have active log in credentials. If a setting is not mentioned, keep default.

# Create a new plan and select 'Standard Plan' in plan type dropdown

## Creating and Saving a New Plan

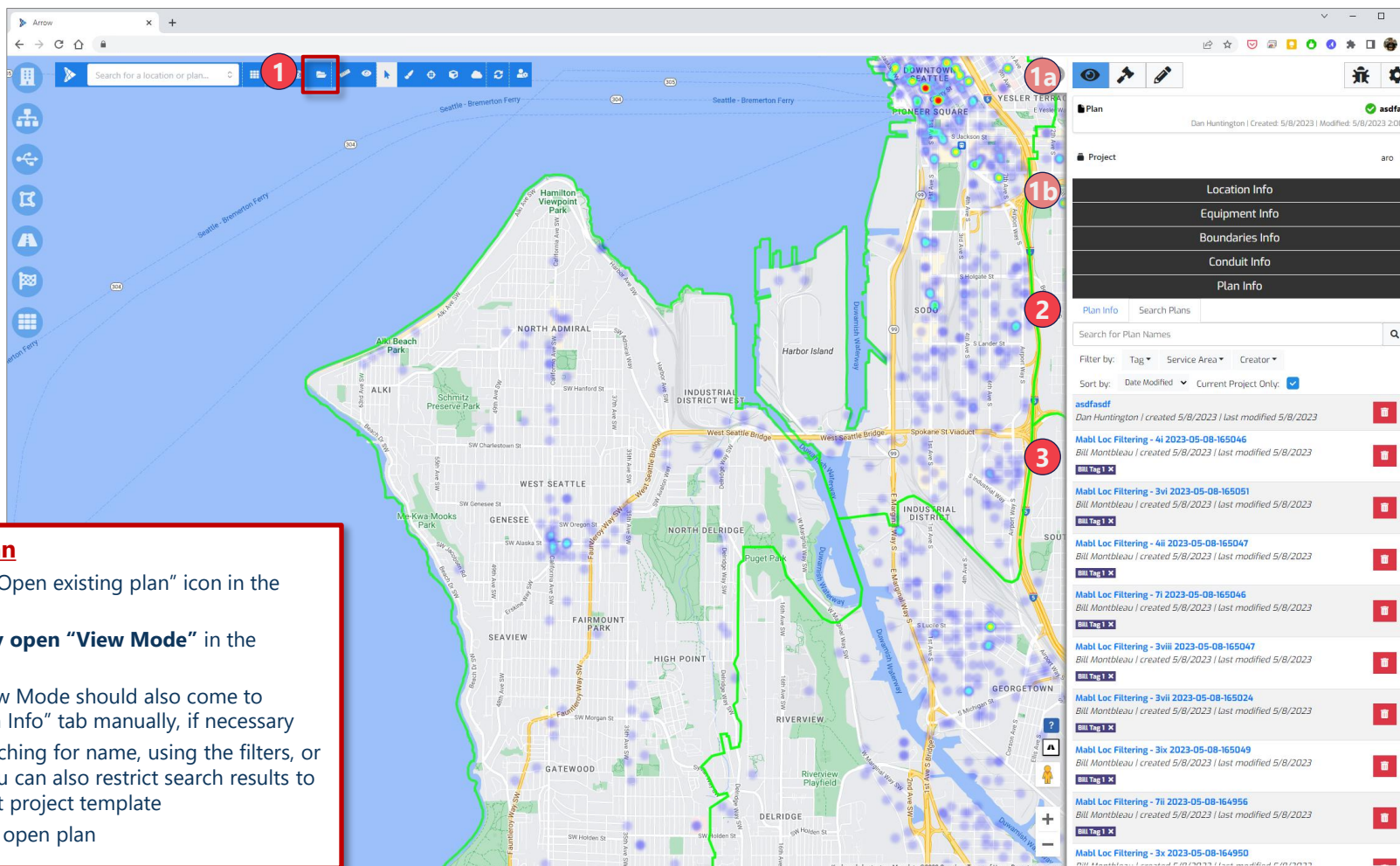
1. **Create New Plan** – Click “Create a New Plan”. Plan Inputs prompt will show up in the center of the screen.
2. **Plan Name** – Give the plan a name
3. **Standard Plan** – Select “Standard Plan” from the dropdown
4. **Endpoint Technology** – Defines which technology to use for the optimization (e.g., Fiber, 5G)
5. **Network Construction** – Defines the network architecture – [Details on the following pages](#)
6. **Create** – Click “Create Plan” to begin the analysis. The plan is also now saved and can be accessed later or shared with other users



**Tip:** Best practice is to save names without spaces; instead, use underscores ("\_")



# Saved plans can be accessed through Plan Info tab in the View Mode



## Opening an Existing Plan

1. **Plan Open Mode** – Click “Open existing plan” icon in the header bar
2. This should automatically open “View Mode” in the Analysis Panel
3. “Plan Info” tab within View Mode should also come to forefront, navigate to “Plan Info” tab manually, if necessary
4. **Search** – Find plan by searching for name, using the filters, or clicking through pages. You can also restrict search results to plans created using current project template
5. **Open** - Click plan name to open plan

Data and Resources selected in Setting section of the Analysis Pane determine what is available for Arrow to use during optimization runs

**Data and Modeling Inputs**

- 1. Data Selection** – select and manage all data layers, e.g. locations, fiber network, service areas etc.
- 2. Resource Selection** – select and manage resource managers that control modeling inputs
- 3. Project Configurations** – manage default project data and resource manager selection

To learn how to load data please reference - Arrow Data Preparation Guide

**Data Selection**

Locations	Households (InfoUSA 2018) x	
	Businesses (InfoUSA 2018) x	
Service Layer	Wirecenters (Geotel 20... x	
Equipment	Empty x	
Fiber Cables	None Selected	
Conduits	Road Segments (Tiger 2017) x	
Conic tile system	None Selected	
Construction location	None Selected	

**Resource Selection**

**Project Configuration**



# Select data layers to include in the analysis

**Data Selection**

- Data Selection** – Navigate to “Data Selection” tab in the accordion
- Pick Data Layers** – use the dropdown menu next to each data type to view available data sources and select desired ones. Select only the sources that are needed for the analysis
- Commit** – When done, hit “Commit” to save your selection

Data Selection	
Locations	C3 OE TC
Graph Edges	uk_roads_all
Equipment	None Selected
Fiber	None Selected
Construction location	None Selected
Service Layer	Westminster Constituencies
Conic tile system	None Selected
Cable construction area	None Selected

Commit Discard

Resource Selection  
Project Configuration

# Select Resource Managers to use in the analysis

**Resource Selection**

- Resource Selection** – While still inside “Plan Settings Mode”, open “Resource Selection” tab in the accordion
- Select Resource Managers** – Select your desired Resource Managers (click the relevant drop down to view available resources and select desired one)
- Commit** – When done, hit “Commit” to save your selection

Resource Selection	
Planning Constraints Manager	Default Planning Constraints Manager
Price Book	Default Price Book
ARPU Manager	Default ARPU Manager
Roic Manager	Default Roic Manager
Rate Reach Manager	Rate Reach Roads
Impedance Manager	Default Impedance Manager
Telecom Spend Matrix System	Default Telecom Spend Matrix
Competition System	Default Competition System
Fusion Manager	Default Fusion Manager
Network Architecture Manager	Default Network Architecture

**Tip:** Not all Resource Managers are needed for each analysis. Select the ones you need, and leave the Default otherwise

# Turn on location layers to be used in simulations, and to view on the map

The screenshot displays the Altman Solon software interface. On the left, a map shows a city area with various location markers (pink dots) and a green boundary. A red box labeled '3' highlights a button in the top toolbar. On the right, a settings panel is visible. A red box labeled '1' highlights the 'Plan' tab, and another red box labeled '2' highlights the 'Location Selection' section. The 'Location Selection' section has checkboxes for 'Small Businesses', 'Medium Businesses', 'Large Businesses', 'Residential', and 'Cell Sites'. The 'Small Businesses' checkbox is checked. Below this, the 'Optimization' section shows 'Optimization Type' set to 'Full Coverage' and 'Pruning Strategy' set to 'Inter Service Area'. The 'Filters' section is expanded, showing 'Routing Selection' with 'Selection Type' set to 'Service Areas' and '1 Service Area selected'. The 'Output' section is also visible.

**Locations**

- 1. Analysis Mode** – Go to “Analysis Mode” on the Analysis Panel
- 2. Enable** – Select the checkbox corresponding to the desired location type(s)  
**Your selections here determine what type of locations will be targeted in the optimization run**
- 3. Heatmap** – Toggle “Location Heatmap On” to see the individual locations

**Tip:** you will not see locations unless they are selected in the data sources



# Adjust optimization settings, and run a plan

## Optimization Inputs

- 1. Analysis Type** – Select desired analysis type, e.g., Network Build
- 2. Settings** – Adjust optimization settings to your desired parameters
- 3. Geography Selection** – Click on the map to select service areas to include in the optimization. Once at least one area is selected, the “Run” button will become available

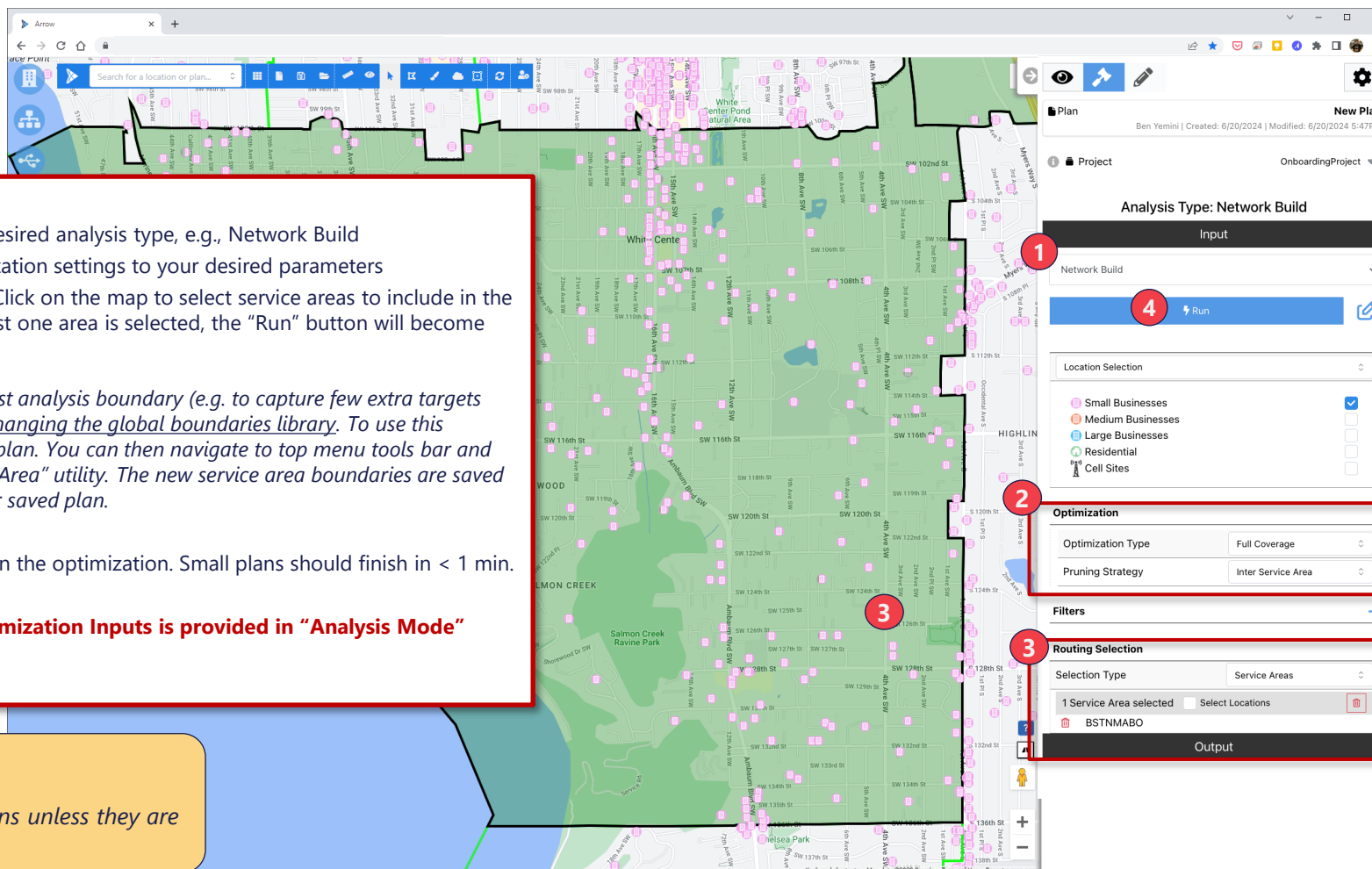
*Note, it is possible to adjust analysis boundary (e.g. to capture few extra targets near the edges) without changing the global boundaries library. To use this capability, first save your plan. You can then navigate to top menu tools bar and use the “Edit Plan Service Area” utility. The new service area boundaries are saved only in the context of your saved plan.*

- 4. Run** – Click “Run” to begin the optimization. Small plans should finish in < 1 min.

**Detailed description of Optimization Inputs is provided in “Analysis Mode” section of this document**



**Tip:** you will not see locations unless they are selected in the data sources



# Analysis Settings define all the aspects of optimization plan to be run

The screenshot shows the 'Analysis Settings' interface. At the top, there's a header bar with icons for view, edit, and settings. Below this, the 'Plan' section (1) shows 'New Plan' and creation/modification dates. The 'Project' section (2) shows 'OnboardingProject'. The 'Analysis Type: Network Build' section (3) has an 'Input' dropdown set to 'Network Build' and a 'Run' button. The 'Location Selection' section (4) shows a list of location types: Small Businesses (checked), Medium Businesses, Large Businesses, Residential, and Cell Sites. The 'Optimization' section (5) has 'Optimization Type' set to 'Full Coverage' and 'Pruning Strategy' set to 'Inter Service Area'. The 'Filters' section (7) has a '+' button. The 'Routing Selection' section (8) has 'Selection Type' set to 'Service Areas'. The 'Selected Areas/Locations' section (9) shows '1 Service Area selected' and a 'Select Locations' button. The bottom of the interface is labeled 'Output'.

## 1. Plan Information

2. **Project** – Defines which project template (defaults for data and resource selection) should be used as a starting point

## 3. Analysis Type

- Network Build: runs an optimization and places equipment as part of plan
- Network Analysis: runs the pruning analysis and shows high level financials for all levels of build

4. **Location Selection** Defines which endpoint types to target in the optimization

5. **Optimization type** – 5 target optimization types available, e.g. full build, coverage target - [Details on the following pages](#)

6. **Pruning Strategy** – Indicates where the budget constraint is to be applied: to all selected geographies ("Inter Service Area") or to each ("Intra Service Area")

7. **Filters** – Adds filters to the locations analyzed based on preconfigured attributes. Note, once a filter is added and service areas are selected the locations that match the filter can be previewed on the map.

8. **Selection Type** – Defines whether the selection mode will be service areas (selecting polygons) or location selection (individual locations)

9. **Selected Areas/Locations** – Lists areas/locations selected for the analysis

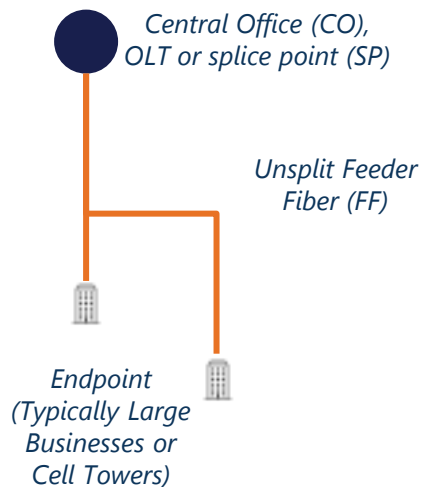
Tip: Please contact Arrow team member to configure filters for your environment



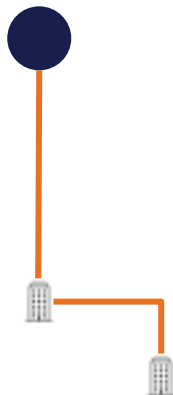
# The four different hub and spoke network architectures can be illustrated by the following fiber architectures

## Point-to-Point (Individual)

Single-level architecture with no passive optical equipment placed along route

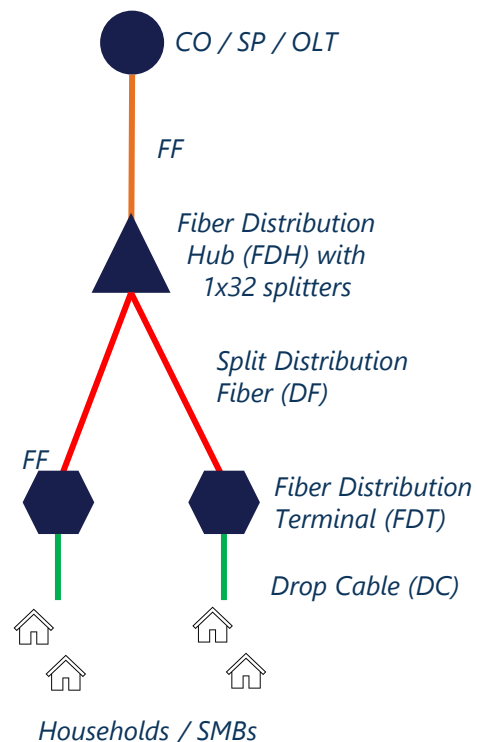


## Direct Routing (Optimized)

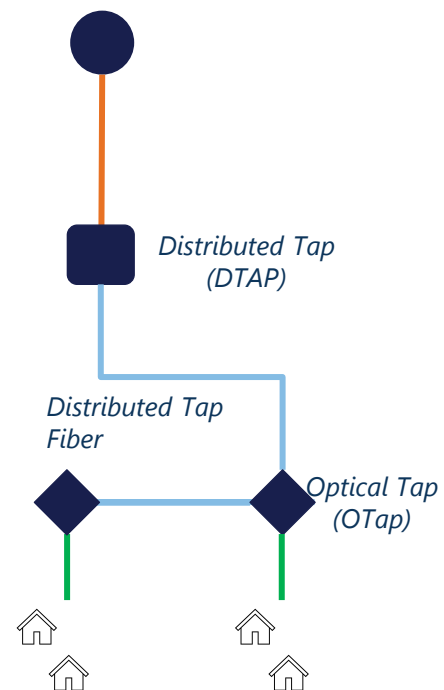


## Hub-Only Split

Two-level architecture with with passive optical equipment placed along route



## Distributed Tap



# In Network Build, Arrow allows users to run five main types of optimizations

Full Coverage	<b>Design network that covers every location in target service area(s)</b> – Coverage provided by fiber or fixed wireless technology, as specified by the user
Budget	<b>Build most financially attractive network for a fixed budget amount</b> – Route to highest-opportunity locations first (IRR-based), until construction budget runs out
Coverage Target	<b>Design NPV-maximizing network that achieves desired coverage level</b> – Route to most attractive locations first, until coverage target is reached
Plan IRR Floor	<b>Within a given budget, build until plan IRR is reached</b> – Continue expanding until plan IRR falls to target IRR, or budget runs out, whichever comes first. Resulting plan IRR will be <u>no less</u> than target IRR
Segment IRR Floor	<b>Build to all locations that exceed target IRR</b> – Every location above target IRR will be routed to. Resulting plan IRR will be <u>above</u> target IRR

# Turn on equipment and cable layers to view on the map

The screenshot displays the Altman Solon software interface. On the left, a sidebar contains a 'Network Equipment' modal (labeled 2) with a list of equipment types and checkboxes for 'Show Boundaries' and 'Show Equipment'. The main map area (labeled 3) shows a residential neighborhood with streets, parks, and a network of red and blue lines representing cables. On the right, a sidebar shows a 'Summary' table with financial metrics and a 'Financial Details' section.

Summary	
NPV	-514851 K
IRR	-4.3 %
Total Subsidy	50.0 K
Total Capex	52,420.0 K
Capex Per Premises	51,372.68
<b>Fiber Capex</b>	
Feeder - Road Estimated (8.21 Miles)	5396.3 K
Distribution - Overlap (6.40 Miles)	50.0 K
Distribution - Road Estimated (36.28 Miles)	51751.7 K
<b>Equipment Capex</b>	
Fiber Distribution Terminal (FDT) (X214)	5107.0 K
Multiple Dwelling Unit (MDU) (X10)	55.0 K
Junction Splitter (XB9)	50.0 K
Central Office (X2)	5100.0 K
Fiber Distribution Hub (FDH) (X4)	560.0 K
<b>Cable Surcharges</b>	
Feeder Fiber	50.0 K
Distribution Fiber	50.0 K
<b>Financial Details</b>	
Network Type	Planned Network

## Equipment

- Open Modals** – While the plan is still running, navigate to “Network Equipment” and “Cables” modals
- Existing vs. Planned** – Toggle viewing existing and planned networking equipment
- Enable** – Toggle specific cable layers to bring into the view. As soon as the optimization finishes running, Planned network equipment and cables will appear on the map (if enabled)

# Plan results, including bill of materials and financial projections, can be accessed in Output panel

The screenshot displays the ARO software interface. On the left, a sidebar shows a 'Network Equipment' panel with a list of equipment types: Exchange, Data Centre, POP Site, Splice point, Manhole, Duct Network Connector, Telecoms Chamber, and Telecoms Chamber - H&S. The main area is a map of a city street grid with various network equipment icons (pink squares) placed along the streets. On the right, the 'Output' panel is visible, showing a 'Summary' section with financial metrics and a 'Financial Details' section with dropdown menus for Network Type, Group, and Metric. The 'Output' panel is divided into 'Input' and 'Output' tabs, with the 'Output' tab selected. The 'Summary' section includes a table with the following data:

Summary	
NPV	£4,847,964.8 K
IRR	228.2 %
Total Capex	£89,531.4K
Fiber Capex	
Feeder - Estimated (147,986 Meters)	£89,531.4K
Equipment Capex	
Exchange (X1)	£0.0K
Junction Splitter (X815)	£0.0K
Telecoms Chamber - H&S (X3,616)	£0.0K

The 'Financial Details' section includes dropdown menus for Network Type (Planned Network), Group (Premises), and Metric (Premises). At the bottom of the 'Output' panel, there are four buttons: 'Report', 'Expand Results', 'Show Resource Settings', and 'Download'. The 'Expand Results' button is highlighted with a red circle and the number 3, and the 'Show Resource Settings' button is highlighted with a red circle and the number 4. The 'Report' button is highlighted with a red circle and the number 2, and the 'Download' button is highlighted with a red circle and the number 1.

**Optimization Output**

- 1. Summary** – Pan summary is displayed in the Output section of the Analysis panel
- 2. Reports** – Plan data can be downloaded. More on the reports in their own section
- 3. Financial Detail** – Additional detail can be accessed by clicking "Expand Results"
- 4. Show Resource Settings** – Resource Manager settings used to run the plan can be viewed.

After running a plan, number of reports can be extracted from Arrow, including financial projections and new fiber routes

**Tip:**  
Custom reports can be added to the list – contact your Arrow administrator for details

**Reports**

Report Name	Format	Download
Fiber - Plan Summary	CSV	Download
Fiber - Service Area Summary	CSV	Download
Financial Output - Plan Summary	CSV	Download
Financial Output - Service Area Summary	CSV	Download
Network And Equipment CapEx - Service Area Summary	CSV	Download
Network Equipment - Plan List	CSV	Download
Network Equipment - Service Area Summary	CSV	Download
Plan KML	KML	Download
Plan Location List	CSV	Download
Plan Settings	CSV	Download
Planned Fiber Detail KML	KML	Download
Planned Fiber Detail SHP	CSV	Download

Close

Clicking on Reports button at the bottom of plan outputs opens window with a list of available reports for download



## Most commonly-used reports include the following

<b>Financial Output Plan Summary</b>	Operating business model, including year over year subscriber, revenue and costs figures for the plan. <i>(Also available per service area as Financial Output - Service Area Summary)</i>
<b>Planned Fiber Detail SHP</b>	Contains the fiber geometries and fiber placement type by service area. <i>(Also available in KML format as Planned Fiber Detail KML)</i>
<b>Routed Locations List</b>	Itemized list of connected locations from the plan. Includes latitude and longitudes of each location, number of premises, as well as the equipment connected to and drop cable length
<b>Network And Equipment Capex Service Area Summary</b>	Breaks down the Capex for each equipment/fiber type, length of fiber built, as well as counts of the different equipment built

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UI Overview

Running 'Network Build' Plans

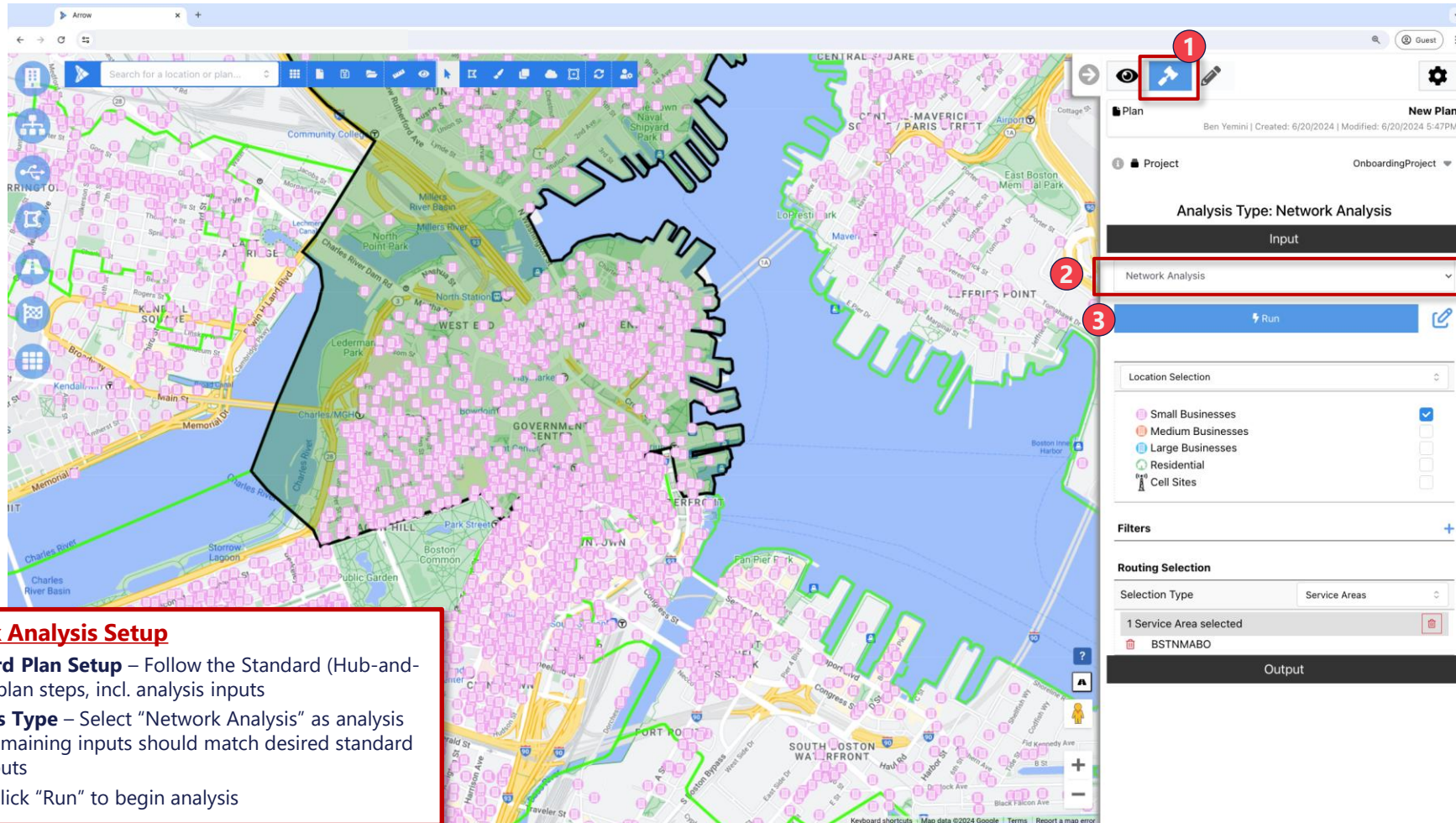
**Running 'Network Analysis' Plans**

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Appendix

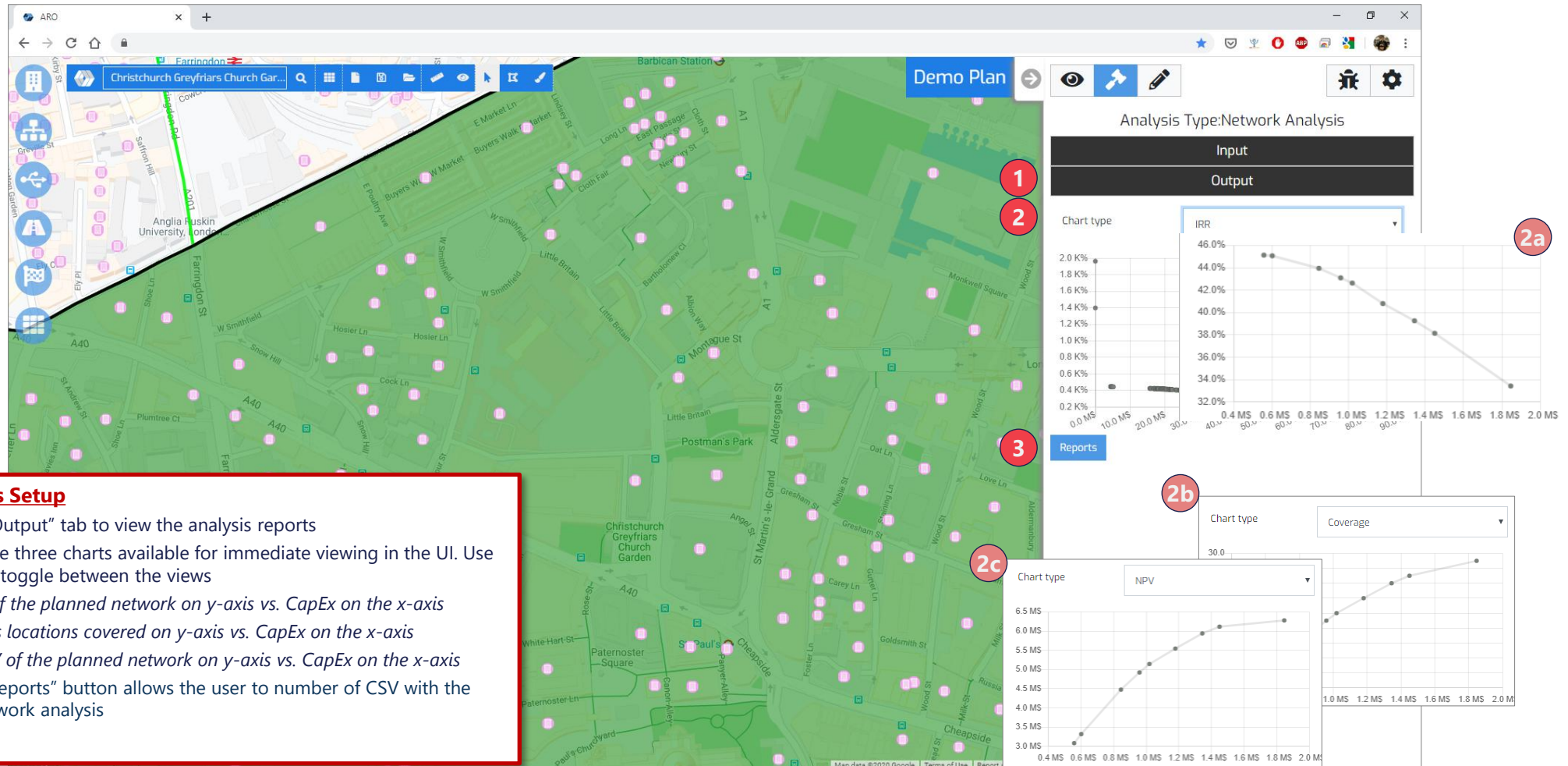
Network Analysis plan setup should mimic that of a standard plan, with analysis type set to Network Analysis



### Network Analysis Setup

1. **Standard Plan Setup** – Follow the Standard (Hub-and-Spoke) plan steps, incl. analysis inputs
2. **Analysis Type** – Select “Network Analysis” as analysis type. Remaining inputs should match desired standard plan inputs
3. **Run** – Click “Run” to begin analysis

# After running a network analysis, there are 3 views of the output in the UI



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**Resource Managers**

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# Resource Managers are configured via their respective management windows

The screenshot shows the Arrow Resource Managers management window. A map of Boston, MA, USA is in the background. A 'Resource Managers' modal is open, showing a list of resource managers. The modal has a 'Filter by Resource Type' dropdown set to 'Impedance Manager' and a 'Search Name' field. The list shows one entry: 'Default Impedance Manager' with a resource type of 'impedance\_mapping\_manager'. To the right of the modal, a 'Resource Selection' table is visible, listing various resource managers and their default values. Red callouts are placed on the interface: 1 points to the 'Plan Settings Mode' button in the top right; 2 points to the 'Resource Selection' table; 3 points to the edit icon (pencil) for the 'Default Impedance Manager'; and 4 points to the expand icon (+) for the 'Default Impedance Manager'.

**Managing Resource Managers**

- 1. Open Settings** – Click “Plan Settings Mode” button to open the pane and “Resource Selection” tab in the accordion
- 2. Manager Edit** – click the edit icon to the right of relevant resource manager. This will open popup screen with a list of Resource Managers
- 3. Clone / Edit** – Other managers cannot be created blank, and need to be cloned. Clicking on the icon also gives user an option to access the manager and edit its values
- 4. Permissions** – Click on the + sign on expand a list of permission holders for the manager

**Tip:**  
Only resource manager owners and Arrow admins can adjust its permissions

Tip: Only resource manager owners and Arrow admins can adjust its permissions

# Price Book is used to specify various network build costs

The screenshot shows the 'Default Price Book' window in the ARO application. The window is overlaid on a map of Boston, MA. The interface includes a 'Morphologycode' dropdown menu (callout 1), a 'Filters' section with a 'Filter Equipment' dropdown, and a list of subitems: 'Central Office', 'Splice Point', 'Fiber Distribution Hub' (callout 2), and 'Fiber Distribution Terminal (1x12)'. The 'Fiber Distribution Hub' subitem is expanded, showing a table with columns for 'Install Equipment', 'Hours', 'Fiber Distribution Hub', 'UnitCost', and 'FDH Ports (per connected location)'. The 'Fiber Distribution Hub' row has a value of '15000' in the 'UnitCost' column. The 'Fiber Distribution Terminal (1x12)' subitem is also expanded, showing a table with columns for 'Install Equipment', 'Hours', and 'AtomicDistributionUnit'. The 'Fiber Distribution Terminal (1x12)' row has a value of '0' in the 'AtomicDistributionUnit' column. A 'Back' button is visible at the bottom right of the window (callout 3). The background shows a map of Boston with various landmarks and streets.

**Price Book**

- 1. Morphology** – Each cost input in Price Book is set for a given morphology (\* by default). Select from the dropdown the morphology you wish to edit. If you plan on using morphology-based costs, please contact Arrow team member for further information
- 2. Inputs** – Cost inputs are spread across multiple tabs
  - *Equipment Item List* – equipment costs
  - *Fiber Labor List* – fiber routing costs
- 3. Save** – When done making edits, click “Save” to commit changes

**Tip:**  
Use Filters (if set up) to display elements relevant to your analysis type

Tip: Use Filters (if set up) to display elements relevant to your analysis type

# ARPU manager controls ARPU assumptions for target endpoints

## ARPU Manager

- 1. Residential ARPU Strategy** – allows you to define the value Arrow uses for residential (household) endpoints by selecting Global, Segmentation or Location Layer.
  - *Global uses the value specified in the UI.*
  - *Location Layer uses the value specified for individual locations in the Locations data layer.*
- 2. Business or Cell Tower ARPU Strategy** – allows you to define the value Arrow uses for Business or Cell Tower endpoints by selecting Global, Telecom Spend Matrix or Location Layer.
  - *Global uses the value specified in the UI.*
  - *Telecom Spend Matrix uses the values derived from the Telecom Spend Matrix resource manager (e.g. industry and employee count).*
  - *Location Layer use the value specified for individual locations in the Locations data layer.*

Separate tabs for each location type and Legacy (BAU) vs. Planned locations

1

Default ARPU Manager

close all

Residential (Legacy - Copper Cat3) Strategy: Global

Residential (Planned) Strategy: Global

ARPU \$ 99

Small Business (Legacy - Copper Cat3) Strategy: Global

Small Business (Planned) Strategy: Global

Medium Business (Legacy - Copper Cat3) Strategy: Global

Discard changes Save

Back

2

Default ARPU Manager

close all

Small Business (Planned) Strategy: Global

Medium Business (Legacy - Copper Cat3) Strategy: Global

ARPU \$ 50

Medium Business (Planned) Strategy: Telecom Spend Matrix

Average Revenue Per User is set by the Telecom Spend Matrix.

Large Business (Legacy - Copper Cat3) Strategy: Global

Discard changes Save

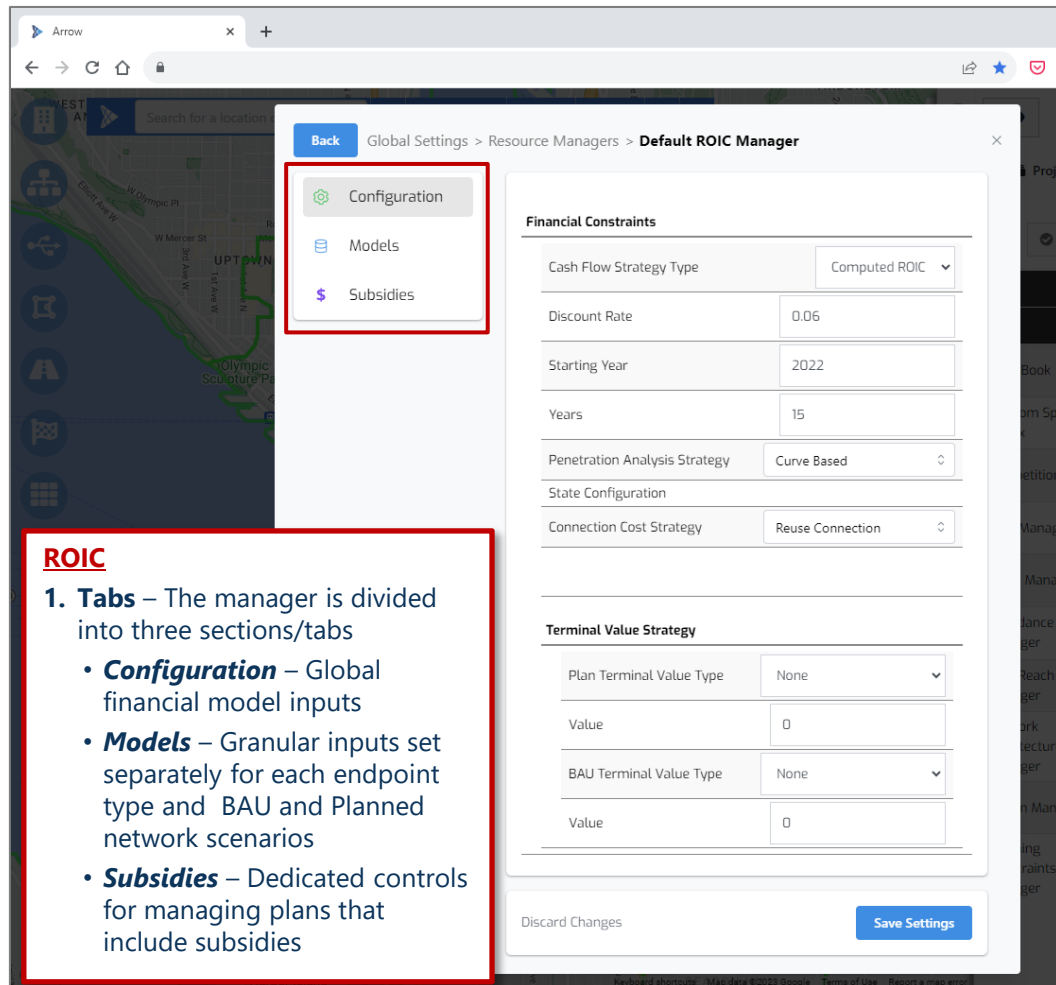
Back



**Tip:** Please contact Arrow team member to adjust ARPU strategy settings

Tip: Please contact Arrow team member to adjust ARPU strategy settings

# ROIC Manager defines the YoY financial profile of each plan analyzed in Arrow



The screenshot shows the Arrow web application interface. On the left is a map of a city area. The main panel displays the 'Default ROIC Manager' configuration page. A sidebar on the left contains three tabs: 'Configuration' (highlighted with a red box), 'Models', and 'Subsidies'. The 'Configuration' tab is active, showing settings for 'Financial Constraints' and 'Terminal Value Strategy'. The 'Financial Constraints' section includes fields for 'Cash Flow Strategy Type' (set to 'Computed ROIC'), 'Discount Rate' (0.06), 'Starting Year' (2022), 'Years' (15), 'Penetration Analysis Strategy' (set to 'Curve Based'), and 'Connection Cost Strategy' (set to 'Reuse Connection'). The 'Terminal Value Strategy' section includes fields for 'Plan Terminal Value Type' (set to 'None'), 'Value' (0), 'BAU Terminal Value Type' (set to 'None'), and 'Value' (0). At the bottom of the configuration panel are buttons for 'Discard Changes' and 'Save Settings'.

**ROIC**

- 1. Tabs** – The manager is divided into three sections/tabs
  - **Configuration** – Global financial model inputs
  - **Models** – Granular inputs set separately for each endpoint type and BAU and Planned network scenarios
  - **Subsidies** – Dedicated controls for managing plans that include subsidies

**Financial Constraints** – Global business case inputs

**Cash Flow Strategy Type** – use Computed ROIC for all plans

**Discount Rate** – Cost of capital / WACC to use for NPV calculation

**Starting Year** – Which year the plan starts (*only relevant when TSM ARPU strategy is used*)

**Years** – How many years to project the cash flows for and use in NPV/IRR calculations

**Penetration Analysis Strategy** – Specifies the method to determine customer penetration over time

- **Curve Based** – Penetration follows a predefined adoption curve (*defined by the penetrationRate parameter on the Models tab*)
- **Flow Share** – Uses granular flow-share modeling to determine each period's subscribers (*using churn and locations growth settings from the Models tab*)

**Connection Cost Strategy** – Specifies how to handle individual location's re-connect costs

- **New Connection** – Charges full new connection cost every time location (re)subscribes (*cost set by ConnectCost field in the Models tab*)
- **Reuse Connection** – Probabilistically model for what fraction of new subscribers had connected in the prior periods and only charge for the net new locations, tracks unconnected customers as a percentage of total premises
- **Improved Reuse Connection** – similar to Ruese Connection, however, this approach tracks unconnected customers as a percentage of non-customers

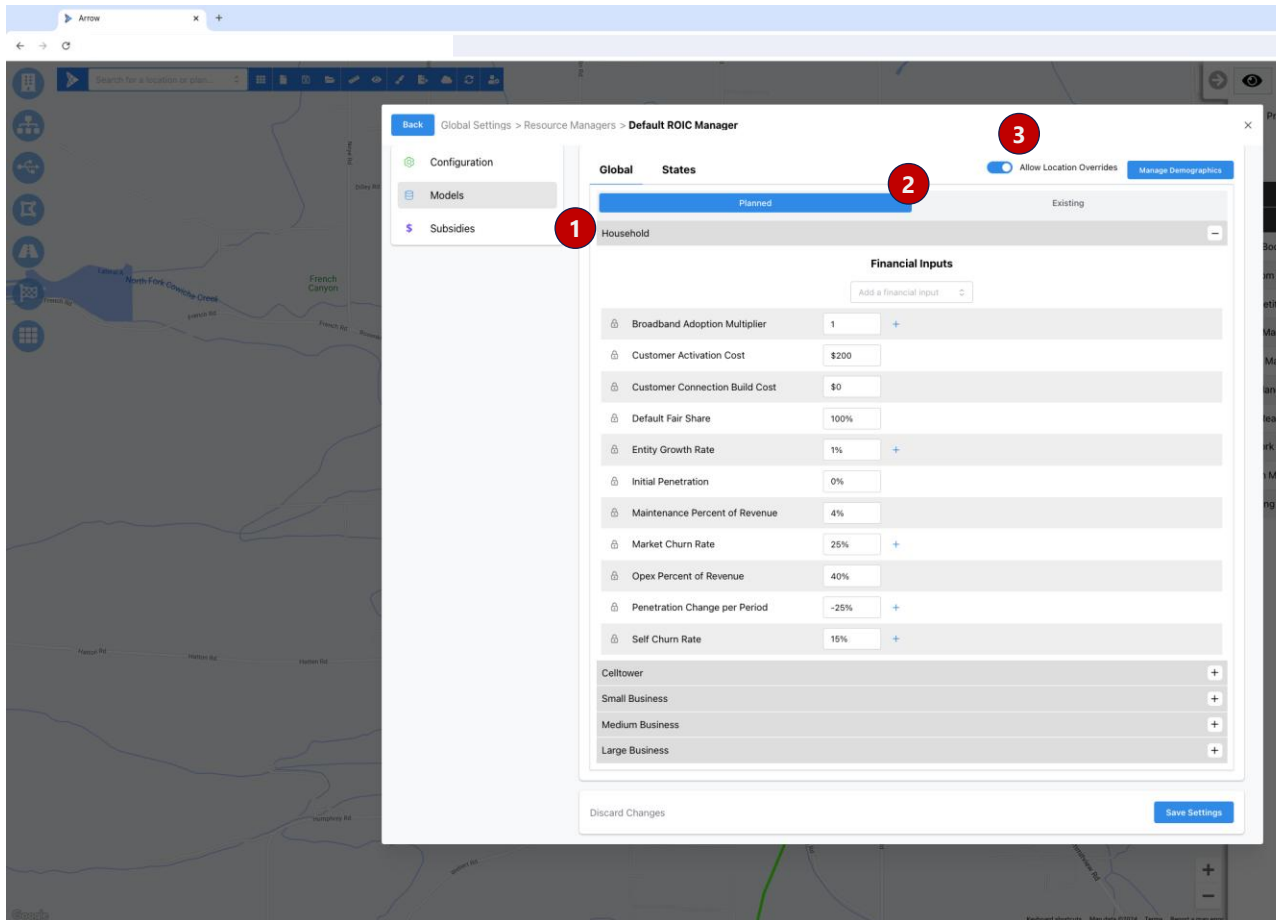
**Terminal Value Strategy** – Set separately for Planned and BAU scenarios

**Terminal Value Type** – Defines what method of TV calculation to use

- **None** – No terminal value applied
- **Net Cash Flow Multiple** – Last year's net cash flow multiplied by the value and added to the last period
- **EBITDA Multiple** – Similar to Net Cash Flow, but maintenance and new build costs are excluded
- **Perpetual Growth** – Assumes that a business will generate cash flows at a constant growth rate (from the last period) forever, must be a value between 0 and 1.

**Value** – Multiplier to use for the given strategy type (fraction for Perpetual Growth)

# ROIC Manager defines the YoY financial inputs for each location analyzed in Arrow



1. **Inputs are set independently for each endpoint type** – Household (Residential), Celltowers and Small, Medium and Large Businesses
2. **For each endpoint type, users can set Planned and Existing location network inputs** – This allows Arrow to account for revenue cannibalization in network overbuild scenarios
  - **Planned** – Financial inputs for locations that will be connecting to the new planned network
  - **Existing** – Financial inputs for locations served by the legacy network / the network that the plan will overbuild. These values are only required if you run overbuild scenarios on your network footprint.
3. **Location Overrides** will leverage inputs defined at the location data library and use the ARPU defined by the ARPU resource manager instead of the inputs specified in the ROIC Models UI settings.

?

**Tip:** See the Arrow Platform user guide for the full list of available ROIC financial inputs.



## Below are a list of commonly updated Resource Manager Settings:

### Price Book Settings

- **Central Office Cost** – Cost for Arrow to create a new Central Office or use an existing Central Office
- **Fiber Distribution Hub**– Cost for Arrow to create Fiber Distribution Hub equipment
- **Fiber Distribution Terminal**– Cost for Arrow to create Fiber Distribution Terminal equipment
- **Install Fiber** – Cost for Arrow to install Feeder or Distribution fiber. (Cost per **meter/foot**).
- **Network Architecture Manager**
- **Hub Clustering Strategy**– Determines which algorithm is used when assigning locations to FDHs

### Network Architecture Manager

- **Hub Clustering Strategy**– Determines which algorithm is used when assigning locations to FDHs
- **Max Distance From Terminal** – This setting determines how close distribution fiber is built to the location. This location can be configured in the following path:
  - *Hub-only Split > Terminal Configuration > Max Distance From Terminal*
- **Multiple Dwelling Unit (MDU) Upgrade Threshold**– This threshold determines how many “single family” locations within the same latitude/longitude there are before they are considered multiple dwelling units (i.e. apartments). This setting can be configured in the following path:
  - *Hub-only Split > Fiber Capacity Configuration > Consolidation Rules > MDU Upgrade Threshold > threshold*

### Planning Constraints Manager

- **Fiber Routing Mode** – Determines whether Arrow will route off existing fiber or build new fiber from scratch.
- **Edge Buffer Distance** – Determines whether Arrow can build fiber outside of a service area. This can be due to Arrow’s optimization algorithms to build shorter fiber routes. **Note** this will **not** connect to locations outside of the service area boundary.

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UI Overview

Running 'Network Build' Plans

Running 'Network Analysis' Plans

Resource Managers

**Quick Tips**

Appendix

# Plan Info tab allows users to search, open, delete, rename and update permissions to existing plans

**Location Info**

- Edit Plan** – Click on “Edit Plan Details” to make any changes to the plan. This will unlock the greyed-out area above
- Update** – Update plan name, start location, tags and user permissions.

**Tip:** For editing any other analysis settings, a plan will need to be re-run

**Plan Info**

Plan Name: Demo Plan

Plan Location: A4, Charing Cross, London WC2N 5DU, UK

Created By: Adam Musial

General tags

Service area tags

Name: Adam Musial

Role Permissions: Owner

Edit Plan Details

Delete Plan

Plan Summary

# Multi-selecting Service Areas using the Lasso Tool

**Locations**

- 1. Lasso Tool** – In Analysis Mode click the multi-select lasso tool.
- 2. Select Service Areas** – Draw a polygon within all the boundaries you would like to perform analysis on.  
**Polygon can be a simple shape within all the desired boundaries. As long as the polygon edge touches the service area it will be included in selection**
- 3. View Selected Service Areas** – Here you can view the service areas you multiselected.

**Analysis Type: Network Build**

**Input**

Network Build

**Run**

**Settings**

Endpoint Technology: Fiber | 5G | DSL

Network Construction: Hub-only s...

**Optimization**

Optimization Type: Full Covera...

Pruning Strategy: Inter Servic...

**Filters**

**Routing Selection**

Selection Type: Service Are...

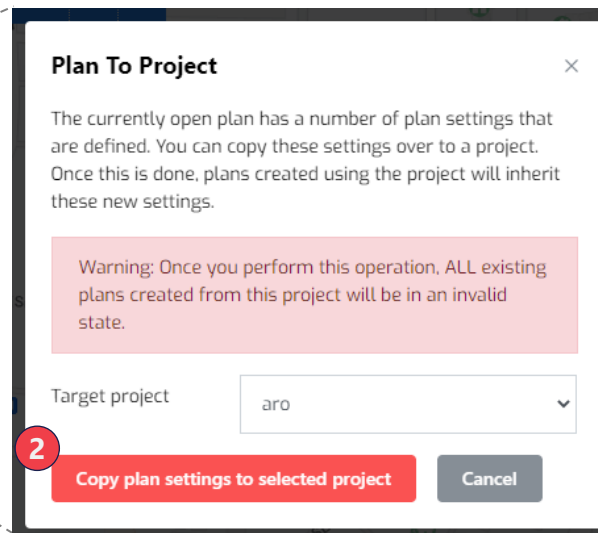
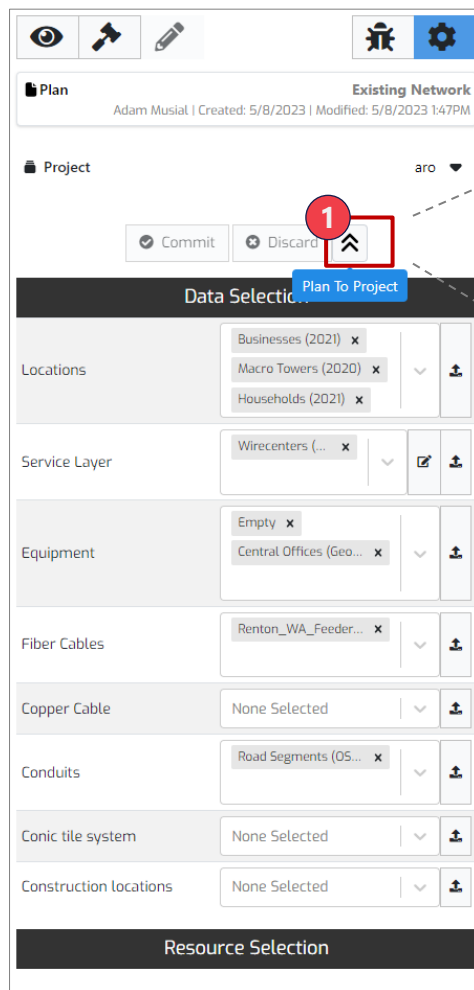
4 items selected

- ELDRTXXA
- MNRDTXXA
- SNRATXXA
- JNCTTXXA

**Output**

## Quick Tips

Users can set their project defaults (data and resources that are enabled by default) and create new Projects directly above Data Selection panel



### Setting Default Project Settings

When in a plan, user can copy that plan's settings (which Data layers and Resource Managers are selected) into project defaults. Going forward, every time a new plan is created, it will automatically select the default data and resource layers from that plan

1. **Plan to Project** – Click on "Plan to Project" to select which project you wish to update
2. **Copy plan settings** – Confirm your action by clicking on "Copy plan settings..." button



### Tips:

- Users, and groups of users, can utilize multiple project templates. Go to User Settings to choose which one is in use by default
- If you don't see a specific data set or resource manager, make sure it has been added to the selected project

Tip: Users, and groups of users, can utilize multiple project templates. Go to User Settings to choose which one is in use by default



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UI Overview

Running 'Network Build' Plans

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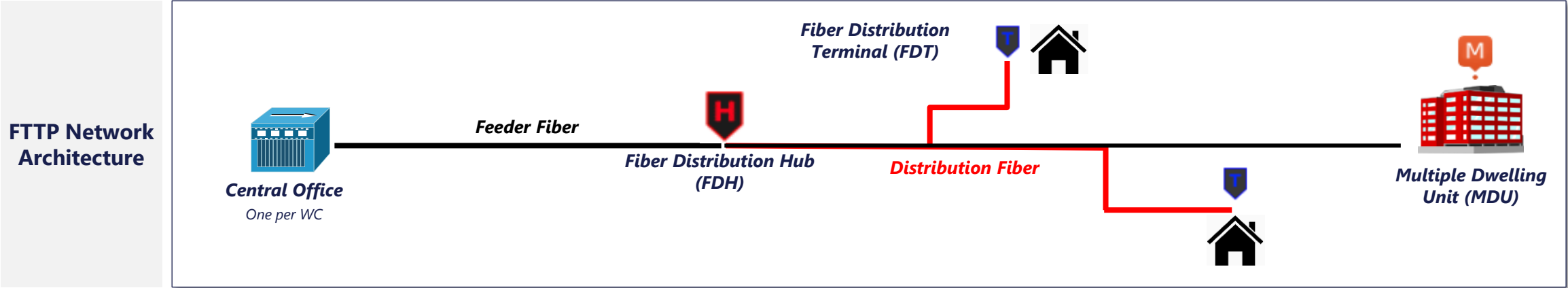
Quick Tips

**Appendix**

Arrow comes preloaded with variety of datasets, requiring only target locations to be supplied by end users

	Dataset	Description and Usage	Source
<b>Boundaries</b>	<b>Census Blocks</b>	Used to map each location to competition data	Tiger
	<b>Wirecenters</b>	Default polygons defining individual areas being analyzed	Geotel
	<b>Zip Codes</b>	Alternative service area for analysis	Tiger
	<b>States, CBSAs, Counties, etc.</b>	Reference boundaries used to conveniently select broader areas for large optimization plans	varies
<b>Competition</b>	<b>FCC Broadband Data Collection (BDC)</b>	Census-block-level broadband availability data, used to calculate each expected fair share for resi and SMB locations	FCC
	<b>Provider Fiber Routes</b>	Publicly available provider fiber routes, used to calculate expected fair share for enterprise and tower locations	Geotel
<b>Business Spend</b>	<b>Altman Solon Telecom Spend Matrix</b>	Proprietary estimates of business spend on telecom services, organized by industry, business size and telecom product	Altman Solon
<b>Wireless Signal Impedance</b>	<b>Clutter</b>	Used in fixed wireless optimization, defines signal degradation characteristics of a given area (30mx30m grid)	NASA
<b>Conduits</b>	<b>Road Segments</b>	Proxy conduits used to define which ways new fiber can go	OpenStreetMap
<b>Target Endpoints</b>	<b>Residential, Business, Towers</b>	Latitude and longitude of target locations to use in planning	client
<b>Network Infrastructure</b>	<b>Network and Equipment Assets</b>	Existing fiber and copper network, and equipment infrastructure, as needed (if at all) for accurate modeling	client

# The Arrow platform uses the following network architecture for FTTP deployments



Element	Central Office	Fiber	FDH	FDT	MDUs
Description	<ul style="list-style-type: none"><li>Hub which a conglomerate signal is distributed to optical nodes in neighborhoods or prem locations</li><li>Carries voice, data, and/or video services to end users</li></ul>	<ul style="list-style-type: none"><li><b>Feeder Fiber:</b> Cable that connects the CO to the FTH splitter</li><li><b>Distrib. Fiber:</b> Cable running from the FDH splitter to the customer premise</li></ul>	<ul style="list-style-type: none"><li>Splits the feeder cable into distribution cables to go to customer premises</li><li>Includes FDH to hold splitter</li></ul>	<ul style="list-style-type: none"><li>Interconnect between the fiber optic distribution network and drop cables connecting customer prems</li></ul>	<ul style="list-style-type: none"><li>Provides connection from network to MDU</li><li>One required per building, generally placed in the basement</li><li>Additional equipment required for each prem</li></ul>
Cost Components	<ul style="list-style-type: none"><li>Inter-office facilities</li><li>Fiber distribution frame</li><li>Power, space, frame</li><li>Ops support system</li></ul>	<ul style="list-style-type: none"><li>Materials</li><li>Labor</li></ul>	<ul style="list-style-type: none"><li>Splitter materials and labor</li><li>Fiber distribution hub materials and labor</li></ul>	<ul style="list-style-type: none"><li>Materials</li></ul>	<ul style="list-style-type: none"><li>Equipment</li><li>Installation</li></ul>

Sources: Altman Solon Research & Analysis

In planning routes to target locations, Arrow factors in a number of necessary network equipment elements and their costs

## Typical Arrow Enterprise / Tower Build Plan Components

Illustrative

