

Arrow Platform

Quick Start Guide



UI Overview

Running 'Network Build' Plans

Running 'Network Analysis' Plans

Resource Managers

Quick Tips

Appendix

Arrow Layout

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 with a map of Boston. 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
8. Near-Net

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

UI Overview

Running 'Network Build' Plans







Running 'Network Analysis' Plans

Resource Managers

Quick Tips

Appendix

We recommend the following order of operations for running optimizations

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

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

1 [Create New Plan]

2 Plan Name

3 Standard Plan

4 Create Plan

1 Create New Plan

Open Existing Plan

ARROW

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 plan a name
- 3. Standard Plan** – Select “Standard Plan” from the dropdown
- 4. Create** – Click “Create Plan” to begin analysis. The plan is also now saved and can 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

- Plan Open Mode** – Click “Open existing plan” icon in the header bar
 - This should automatically open “View Mode” in the Analysis Panel
 - “Plan Info” tab within View Mode should also come to forefront, navigate to “Plan Info” tab manually, if necessary
- 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
- 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

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

Data Selection

Locations	Households (InfoUSA 2018) x	↓
	Businesses (InfoUSA 2018) x	↓
Service Layer	Wirecenters (Geotel 20...	↓
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

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

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 Type	Selected Source	Actions
Locations	C3 OE TC	[Edit] [Add]
Graph Edges	uk_roads_all	[Add]
Equipment	None Selected	[Add]
Fiber	None Selected	[Add]
Construction location	None Selected	[Add]
Service Layer	Westminster Constituencies	[Edit] [Add]
Conic tile system	None Selected	[Add]
Cable construction area	None Selected	[Add]

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

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

Data Selection	
Resource Selection	
Planning Constraints Manager	Default Planning Constraints ▾
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 ▾

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

Locations

- Analysis Mode** – Go to “Analysis Mode” on the Analysis Panel
- 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
- 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

- Analysis Type** – Select desired analysis type, e.g., Network Build
- Settings** – Adjust optimization settings to your desired parameters
- 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.

- 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 Mode Settings' interface. It is divided into several sections: Plan, Project, Analysis Type, Input, Location Selection, Settings, Optimization, Filters, Routing Selection, and Output. Red circles with numbers 1 through 11 are overlaid on the interface to highlight specific settings:

- 1. Plan: Shows 'Sample Plan' with creation and modification dates.
- 2. Project: Shows 'Overbuilder' as the selected project template.
- 3. Analysis Type: Shows 'Network Build' selected in the dropdown.
- 4. Location Selection: Shows a list of location types: Small Businesses, Medium Businesses, Large Businesses, Residential (checked), and Cell Sites.
- 5. Settings: Shows 'Endpoint Technology' set to 'Fiber'.
- 6. Settings: Shows 'Network Construction' set to 'Hub-only Split'.
- 7. Optimization: Shows 'Optimization Type' set to 'Full Coverage'.
- 8. Optimization: Shows 'Pruning Strategy' set to 'Inter Service Area'.
- 9. Filters: Shows a plus sign to add filters.
- 10. Routing Selection: Shows 'Selection Type' set to 'Service Areas'.
- 11. Routing Selection: Shows a red error message: 'Please select at least one Service Area'.

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. **Endpoint Technology** – Defines which technology to use for the optimization

6. **Network Construction** – Defines the network architecture - [Details on the next page](#)

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

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

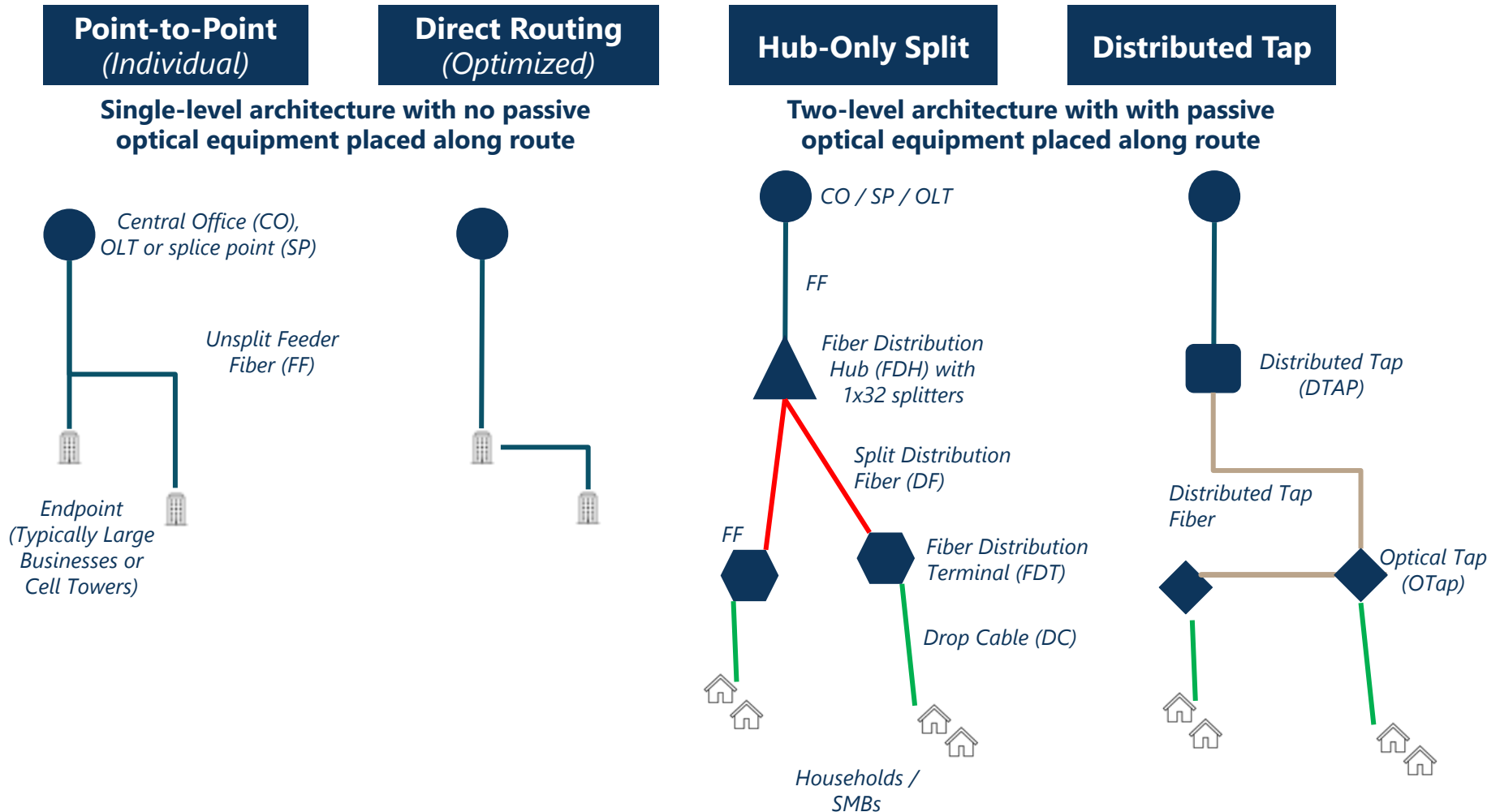
9. **Filters** – Adds filters to the locations analyzed based on preconfigured attributes. Note, once a filter is added and service areas are selected the locations that match the filter can be previewed on the map.

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

11. **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



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

Full Coverage

Design network that covers every location in target service area(s) – Coverage provided by fiber or fixed wireless technology, as specified by the user

Budget

Build most financially attractive network for a fixed budget amount – Route to highest-opportunity locations first (IRR-based), until construction budget runs out

Coverage Target

Design NPV-maximizing network that achieves desired coverage level – Route to most attractive locations first, until coverage target is reached

Plan IRR Floor

Within a given budget, build until plan IRR is reached – Continue expanding until plan IRR falls to target IRR, or budget runs out, whichever comes first. Resulting plan IRR will be no less than target IRR

Segment IRR Floor

Build to all locations that exceed target IRR – Every location above target IRR will be routed to. Resulting plan IRR will be above target IRR

Turn on equipment and cable layers to view on the map

The screenshot shows a web-based interface for network planning. On the left, a 'Network Equipment' modal is open, listing various equipment types such as Central Office, Remote OLT, Splice Point, Fixed Wireless Site, Remote Terminal (DSLAM), Fiber Distribution Hub (FDH), Fiber Distribution Terminal (FDT), Bulk Distribution Terminal (Drop Coil), Multiple Dwelling Unit (MDU), Location Connector, Network Connector, Network Anchor, Loop Extender, Junction Splitter, and Slack Loop. The modal has checkboxes for 'Existing' and 'Planned' equipment. On the right, a 'Summary' panel displays financial metrics: NPV (-51,485.1 K), IRR (-4.3%), Total Subsidy (50.0 K), Total Capex (52,420.0 K), and Capex Per Premises (51,372.68). Below this, 'Fiber Capex' and 'Equipment Capex' are detailed, and 'Cable Surcharges' are also listed. A 'Financial Details' section at the bottom shows 'Network Type' set to '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

Optimization Output

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

Financial Details

Network Type: Planned Network Entity Type: Medium Businesses

	Summary	Premises	Subscribers	Revenue	Opex	Capex	Cash Flow
NPV	591,420.4 K						
IRR	1,119.6 %						
Total Capex	53,552.3K						
Fiber Capex							
Feeder (5 Miles)	5,235.4K						
Feeder (74 Miles)	53,316.8K						
Equipment Capex							
Junction Splitter (X185)	50.0K						

Output Panel Summary

Analysis Type: Network Build	
Input	
Output	
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 (X185)	£0.0K
Telecoms Chamber - H&S (X3,616)	£0.0K

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

The screenshot shows the Arrow software interface with a 'Reports' window open. The window lists the following reports for download:

Report Name	Format	Action
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

A yellow callout box contains the text: "Clicking on Reports button at the bottom of plan outputs opens window with a list of available reports for download". The 'Reports' button in the bottom right of the main interface is highlighted with a red box.

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

Most commonly-used reports include the following

Financial Output Plan Summary

Operating business model, including year over year subscriber, revenue and costs figures for the plan.

(Also available per service area as Financial Output - Service Area Summary)

Planned Fiber Detail SHP

Contains the fiber geometries and fiber placement type by service area.

(Also available in KML format as Planned Fiber Detail KML)

Routed Locations List

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

Network And Equipment Capex Service Area Summary

Breaks down the Capex for each equipment/fiber type, length of fiber built, as well as counts of the different equipment built

UI Overview

Running 'Network Build' Plans

Running 'Network Analysis' Plans

Resource Managers

Quick Tips

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

Network Analysis Setup

- 1. Output** – Click “Output” tab to view the analysis reports
- 2. Charts** – There are three charts available for immediate viewing in the UI. Use the dropdown to toggle between the views
 - *IRR* – shows IRR of the planned network on y-axis vs. CapEx on the x-axis
 - *Coverage* – shows locations covered on y-axis vs. CapEx on the x-axis
 - *NPR* - shows NPV of the planned network on y-axis vs. CapEx on the x-axis
- 3. Reports** – The “Reports” button allows the user to number of CSV with the details of the network analysis

The screenshot shows a map of a city area with a network overlay. The interface includes a 'Demo Plan' tab, a 'Reports' button, and three charts: 'IRR' (Internal Rate of Return), 'Coverage', and 'NPV' (Net Present Value). The IRR chart shows a downward trend from approximately 45% to 33% as CapEx increases from 0.4 MS to 2.0 MS. The Coverage chart shows an upward trend from approximately 30% to 35% as CapEx increases from 0.4 MS to 2.0 MS. The NPV chart shows an upward trend from approximately 3.0 MS to 6.5 MS as CapEx increases from 0.4 MS to 2.0 MS.

UI Overview

Running 'Network Build' Plans

Running 'Network Analysis' Plans

Resource Managers

Quick Tips

Appendix

Resource Managers are configured via their respective management windows

The screenshot shows a web application interface for managing resource managers. A modal window titled "Resource Managers" is open, displaying a list of managers. The background shows a "Data Selection" pane with a table of resource managers and their default values. Red callouts 1-4 point to specific UI elements: 1. Settings gear icon in the top right. 2. Edit icon in the right column of the "Data Selection" table. 3. Edit icon in the modal window. 4. Plus icon in the modal window.

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

Price Book is used to specify various network build costs

Price Book

- 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
- Inputs** – Cost inputs are spread across multiple tabs
 - *Equipment Item List* – equipment costs
 - *Fiber Labor List* – fiber routing costs
- Save** – When done making edits, click “Save” to commit changes

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.
- Segmentation uses the values based on the product mix percentage specified in the UI across pre-defined segments. Note, you can adjust revenue, OpEx and acquisition cost at the individual product level.
- 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.

1

Default ARPU Manager

close all

Residential (Legacy - Copper Cat3) Strategy: Global

Residential (Planned) Strategy: Global

ARPU \$ 99

Residential (Planned) Strategy: Segmentation

	Default Product	Data Only	Data and Video	Triple Play
Default Segment	0100 %	0 %	0 %	0 %
Young Professionals	0 %	75 %	20 %	5 %
Family	0 %	025 %	50 %	25 %
Retired	0 %	010 %	030 %	60 %
Other	0 %	30 %	40 %	30 %

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

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

Segmentation strategy allows you to assign ARPU to residential endpoints based on likely product mix

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

ROIC manager controls the YoY financial profile of a new build, all set by location type and technology (copper or fiber)

ROIC Manager

- Penetration Start** – starting penetration of passed locations
- Penetration Rate** – determines the pace of subscriber ramp to fair share value (for curve-based penetration strategy)
- Entity Growth** – annual growth in locations
- Churn Rate** – own annual churn rate, used to calculate new connects
- Market Churn Rate** – market annual churn rate, only used when using flow-share strategy
- OpEx Percent** – fraction of revenue spent on OpEx
- Maintenance Expense** – fraction of revenue spent on maintenance expenses
- Connection Cost** – success-based CapEx, incurred when location subscribes to the new network
- Broadband Penetration** – broadband adoption ratio, effectively adjusting total number of locations eligible to subscribe
- customerConnectionCost** – The cost to connect a new customer, regardless of connection strategy. It is applied per-customer, not per-connection.
- penetrationWindow** – The number of periods over which to average the penetration, when it is used as an input to another curve (best to leave set to 1)

Tip: For greenfield build plans, set cat3 penetrationStart = 0 and penetrationRate = -0.00001 to prevent Arrow from creating BAU case

ROIC manager controls the YoY financial profile of a new build, all set by location type and technology (copper or fiber)

ROIC Manager Configuration

1. **Cash Flow Strategy Type** – use Computed ROIC for all plans
2. **Discount Rate** – Cost of capital / WACC to use for NPV calculation
3. **Starting Year** – Plan start year
4. **Years** – number of years to include in cash flow projections
5. **Penetration Analysis Strategy** – Specifies the method to determine customer penetration (Flow Share or Adoption Curve / Curve Based)
6. **Connection Cost Strategy** – Specifies how to handle location re-connect costs (treat as new connection or reuse [no cost])
7. **Competition Provider Strength** – Adjust competitive profile of the build, effectively moving plan fair share up or down
8. **Terminal Value Strategy Type** – Controlled separately for Legacy (BAU) and Planned Network. Available Options: None, Net Cash Flow Multiple EBITDA Multiple, or Perpetual Growth Method
9. **Value** – value to apply to Terminal Value strategy, if applicable

Global Settings > Resource Managers > Default Roic Manager

Models

Configuration

Subsidies

Financial Constraints

Cash Flow Strategy Type	1	External
Discount Rate	2	0.06
Starting Year	3	2022
Years	4	15
Penetration Analysis Strategy	5	Curve Based
Connection Cost Strategy	6	Reuse Connection
Competition Provider Strength	7	1

Terminal Value Strategy

Plan Terminal Value Type	8	None
Value	9	0
BAU Terminal Value Type		None
Value		0

Back

Discard Changes

Save Settings

ROIC manager controls the YoY financial profile of a new build, all set by location type and technology (copper or fiber)

ROIC Manager Configuration

- 1. Subsidies** – applies a subsidy to offset costs for individual locations marked as eligible for subsidy (grant_eligible attribute set to 1)
- 2. Use Location Layer** – Subsidy input can be defined in the Locations data layer (“ROIC.PLAN.SUBSIDY” attribute)
- 3. Use Dynamic Calculation** – select calculation type to define subsidy:
 - Percentage Calculation Type applies a % value of the proportional cost required to reach locations marked as grant eligible
 - IRR Calculation Type applies the required proportional cost to achieve IRR value for locations marked as grant eligible
 - Fixed Calculation Type applies a fixed \$ amount to all locations marked as grant eligible
- 4. Use Both** – defaults first to the value identified in the location layer. If no value is present in the location layer the Dynamic Calculation is used for locations marked as grant eligible

The screenshot shows the 'Default Roic Manager' configuration window. It features a 'Subsidies' section with a toggle switch labeled '1' and 'enabled'. Below this is the 'Calculation Setting' section, which includes three radio buttons: 'Use Location layer' (labeled '2'), 'Use Dynamic Calculation' (labeled '3'), and 'Use Both (Location Layer Default)'. Under 'Use Dynamic Calculation', there is a 'Calculation Type' dropdown set to 'Percentage' (labeled '4') and a 'Value' input field set to '80 %'. Below that is a 'Subsidy Range' section with input fields for '\$ 0' and '\$ 5,000'. At the bottom of the window are buttons for 'Discard Changes', 'Reset Defaults', and 'Save Settings'. A yellow callout box points to the 'Subsidy Range' section.

For Percentage or IRR Calculation Types you can add a Subsidy Range amount

- If the dynamic subsidy calculated for a location is below the minimum amount the minimum amount is used instead.
- If the subsidy calculated for a location is above the maximum amount the maximum amount is used instead.

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

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.

UI Overview

Running 'Network Build' Plans

Running 'Network Analysis' Plans

Resource Managers

Quick Tips

Appendix

Quick Tips

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

The screenshot shows the ARD software interface with a map of London. The 'Plan Info' sidebar is open, displaying details for a plan named 'Demo Plan'. The sidebar includes sections for Location Info, Equipment Info, Boundaries Info, Conduit Info, and Plan Info. The Plan Info section is highlighted with a red box and contains the following information:

Name	Role Permissions
Adam Musial	Owner

Below the table are two buttons: 'Edit Plan Details' (labeled with a red '1') and 'Delete Plan' (labeled with a red '2').

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

Multi-selecting Service Areas using the Lasso Tool

Locations

- Lasso Tool** – In Analysis Mode click the multi-select lasso tool.
- 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
- View Selected Service Areas** – Here you can view the service areas you multiselected.

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

Plan To Project

The currently open plan has a number of plan settings that are defined. You can copy these settings over to a project. Once this is done, plans created using the project will inherit these new settings.

Warning: Once you perform this operation, ALL existing plans created from this project will be in an invalid state.

Target project: aro

Copy plan settings to selected project Cancel

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

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

UI Overview

Running 'Network Build' Plans

Running 'Network Analysis' Plans

Resource Managers

Quick Tips

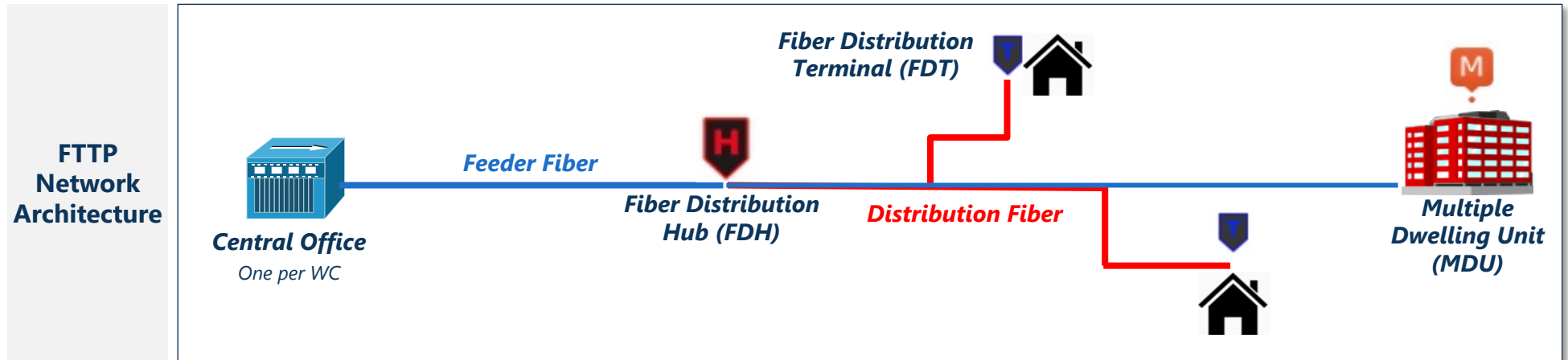
Appendix

Data

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

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

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

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

