Simulation Engine Documentation

Overview

The simulation engine processes three main dynamics for each role and level:

1. **Churn (Attrition)**
2. **Progression (Promotion)**
3. **Recruitment (Hiring)**

Core Components

1. Churn (Attrition)

- Each level has separate churn rates for H1 and H2
- Churn is applied first in each period
- Formula: `new_total = current_total * (1 - churn_rate)`
- Example: If a level has 100 people and 5% churn, 95 people remain

2. Progression (Promotion)

- Each level has separate progression rates for H1 and H2
- Progression is calculated after churn
- Formula: `progressed = current_total * progression_rate`
- Progressed employees move to the next level
- Special case: No progression for M, SrM, PiP levels in H1

3. Recruitment (Hiring)

- Each level has separate recruitment rates for H1 and H2
- Recruitment is applied last
- Formula: `new_recruits = current_total * recruitment_rate`
- Special handling for zero FTE:
    - For new offices: minimum 1 recruit
    - For other offices: calculated based on recruitment rate

Processing Order

For each period (H1 or H2), the engine processes levels in this order:

1. Apply churn to current level
2. Calculate and apply progression
3. Move progressed employees to next level
4. Apply recruitment to current level

Default Rates

Junior Levels (A, AC)

- Higher progression (10-15% H1, 15-20% H2)
- Higher churn (4-5%)
- Higher recruitment (15-25%)

Mid Levels (C, SrC)

- Moderate progression (10-15% H1, 15-20% H2)
- Lower churn (3%)
- Lower recruitment (10-15%)

Senior Levels (M, SrM, PiP)

- Lower progression (0-5%)
- Lowest churn (1-2%)
- Lowest recruitment (5-10%)

Example Configuration

```
{
    "A": {
        "total": 10,
        "progression_h1": 0.1,  # 10% progression in H1
        "progression_h2": 0.15, # 15% progression in H2
        "recruitment_h1": 0.2,  # 20% recruitment in H1
        "recruitment_h2": 0.25, # 25% recruitment in H2
        "churn_h1": 0.05,       # 5% churn in H1
        "churn_h2": 0.05,       # 5% churn in H2
        "utr_h1": 0.85,         # 85% UTR in H1
        "utr_h2": 0.90          # 90% UTR in H2
    }
}
```

Recruitment Example

Scenario 1: Normal Recruitment

Let's walk through a recruitment example for Level A in H1:

1. **Initial State**
   - Current FTE: 10
   - Recruitment Rate: 20% (0.2)
   - Churn Rate: 5% (0.05)
   - Progression Rate: 10% (0.1)
2. **Process**

```
Step 1: Apply Churn
- Churned employees = 10 * 0.05 = 0.5 (rounded to 1)
- Remaining employees = 10 - 1 = 9


Step 2: Apply Progression
- Progressed employees = 9 * 0.1 = 0.9 (rounded to 1)
- Employees after progression = 9 - 1 = 8


Step 3: Apply Recruitment
- New recruits = 8 * 0.2 = 1.6 (rounded to 2)
- Final FTE = 8 + 2 = 10
```

Scenario 2: New Office Recruitment

For a new office with zero FTE:

1. **Initial State**
   - Current FTE: 0
   - Recruitment Rate: 20% (0.2)
   - Office Type: New Office
2. **Process**

   ```
   Step 1: Check Office Type
   - New Office → Minimum 1 recruit

   Step 2: Calculate Recruitment
   - Base calculation = 10 * 0.2 = 2
   - Minimum recruit = 1
   - Final recruits = max(1, 2) = 2
   ```

Scenario 3: Growth from Zero (Established Office)

For an established office with zero FTE:

1. **Initial State**
   - Current FTE: 0
   - Recruitment Rate: 20% (0.2)
   - Office Type: Established Office
2. **Process**

   ```
   Step 1: Check Office Type
   - Established Office → No minimum recruit requirement

   Step 2: Calculate Recruitment
   - Base calculation = 10 * 0.2 = 2
   - Final recruits = 2
   ```

Key Points

- Recruitment is always calculated after churn and progression
- New offices have a minimum recruitment of 1 FTE
- Recruitment rates can be different for H1 and H2
- The base calculation (10 FTE) ensures growth even from zero

- All calculations are rounded to whole numbers

Special Cases

1. New Offices

- Minimum recruitment of 1 FTE even with zero current FTE
- Higher recruitment rates to support growth

2. Zero FTE Handling

- Recruitment calculated based on a base of 10 FTE
- Ensures growth even from zero

3. Management Levels

- No progression in H1 for M, SrM, PiP levels
- Lower progression rates overall

Output Tracking

The system tracks and outputs:

- Total FTE for each level
- Price and salary changes
- Journey totals
- Period-by-period changes

Office Size Classification

Offices are classified based on total FTE:

- **New Office**: 0-24 FTE
- **Emerging Office**: 25-200 FTE
- **Established Office**: 200-500 FTE
- **Mature Office**: 500+ FTE