

GraphQLConf

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GraphQL
Foundation

The 40,000-field query: Optimizations for Gigantic high-QPS Operations

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Parsing is rarely a problem

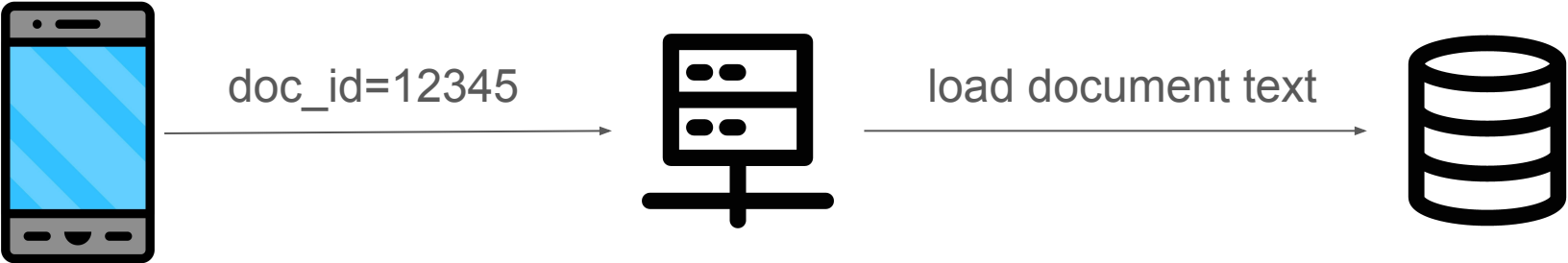
- Most queries are small
- Parsing field < executing field

Counter example ...

```
query NewsFeedQuery {  
  news_feed(first:1) {  
    # Refine union type  
    ... StatusUpdateFragment  
    ... BirthdayPostFragment  
    # 100s more fragment spreads  
  }  
}
```

```
# 40,000 fields  
# 60 ms to parse  
# Executing first story is 300ms
```

GraphQL Execution Flow



```
# Document text
query ProfileQuery {
  viewer {
    id
    name
  }
}
```

parsing

```
# Abstract Syntax Tree (AST)
Document
└─ OperationDefinition (query "ProfileQuery")
   └─ SelectionSet
      └─ Field "viewer"
         └─ SelectionSet
            ├── Field "id"
            └─ Field "name"
```

Least Recently Used (LRU) Document Cache

| key (doc_id) | value (parsed AST) | Last Use |
|--------------|---|----------|
| 1001 | <code>Document └─ OperationDefinition (query "ProfileQuery") ...</code> | 10s ago |
| 1002 | <code>Document └─ OperationDefinition (query "FriendsQuery") ...</code> | 1s ago |
| 1003 | <code>Document └─ OperationDefinition (mutation "LoginMutation")</code> | 2s ago |

Limitation of Caching: Cardinality

100 queries/app

× dozens of apps

× 4 OSs

× device types

× 2 week release cycle

65% hit rate

= 500,000 persisted documents in 24h

Lazy Fragment Parsing

Persisted Document

```
query NewsFeedQuery {  
  news_feed(first:1) {  
    ... StatusUpdateFragment  
    ... BirthdayPostFragment  
  }  
}
```

```
fragment StatusUpdateFragment  
  on StatusUpdate { id }  
fragment BirthdayPostFragment  
  on BirthdayPost { id }
```

| Fragment Name | Defined At |
|----------------------|------------|
| StatusUpdateFragment | Line 8 |
| BirthdayPostFragment | Line 9 |

Lazy Fragment Parsing: Walkthrough

```
# Initially parsed
query NewsFeedQuery {
  news_feed(first:1) {
    ... StatusUpdateFragment
    ... BirthdayPostFragment
  }
}
```

```
fragment StatusUpdateFragment on StatusUpdate { id } # lazy parsed
fragment BirthdayPostFragment on BirthdayPost { id } # lazy parsed
```

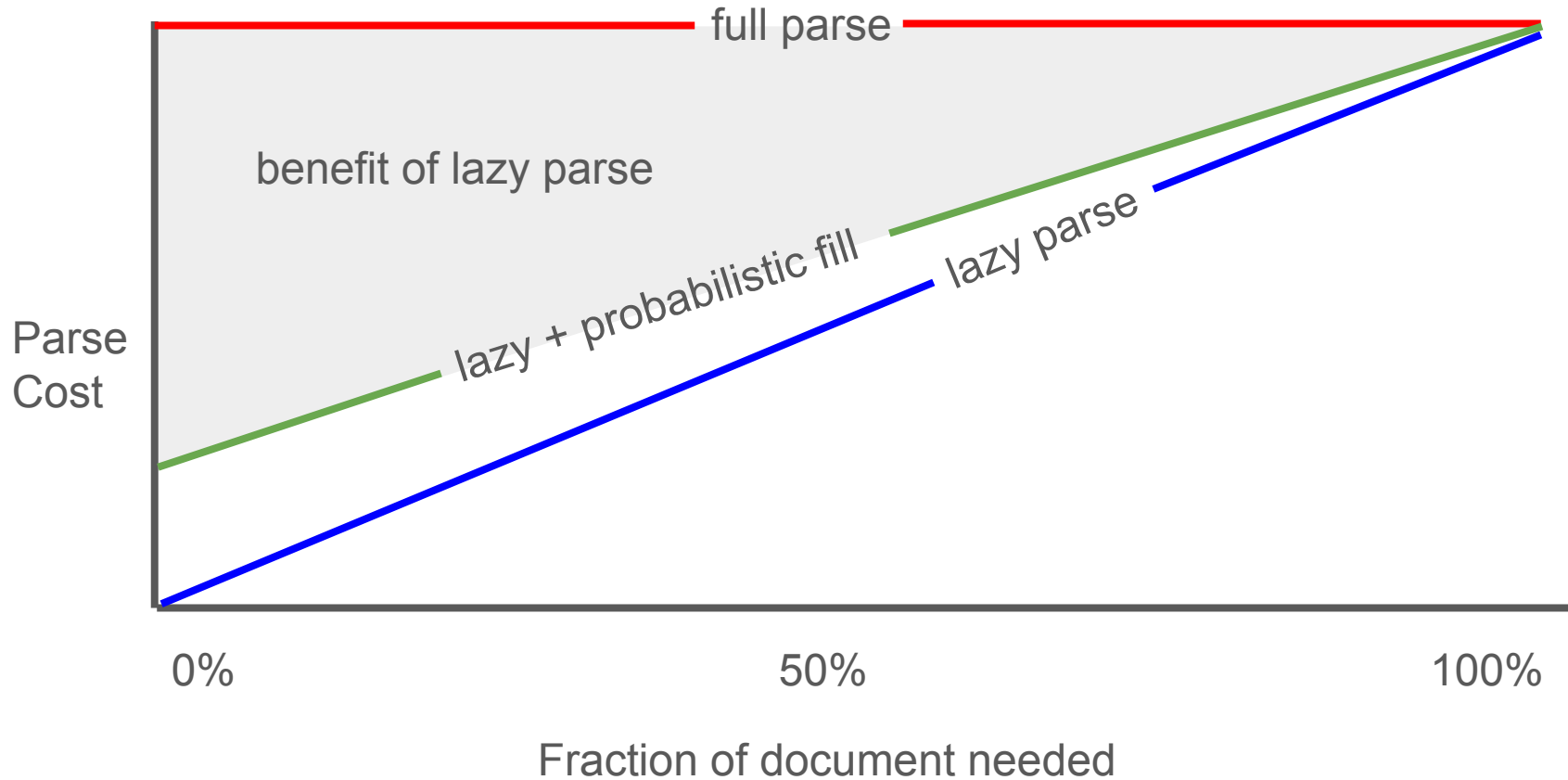
60ms -> 2ms

highlight = parsed

Lazy fragment parsing incompatible with document cache

| | Document cache | Lazy fragment parsing |
|------|-------------------------|-----------------------|
| Hit | loads full AST | nothing to parse |
| Miss | must fill with full AST | produces partial AST |

Cost on cache miss



Production Impact

| Cache | Parsing | Parsing share of GraphQL server overhead |
|---|----------------|--|
| none | full | 37% |
| documents | full | 20% |
| none | lazy fragments | 10% |
| documents (probabilistic cache fill) | lazy fragments | 2% |

When caching plateaus, parse less

Questions?