

# MongoDB 查询性能分析

MongoDB 3.0之后，explain的返回与使用方法与之前版本有了很大的变化，目前所使用的是3.4.7版本，本文仅针对MongoDB 3.0+的explain进行讨论。3.0+的explain有三种模式，分别是：

**queryPlanner**、**executionStats**、**allPlansExecution**。

常用的是executionStats模式，主要分析这种模式。

重要参数详解：

```
=====
{
  "queryPlanner": {
    "plannerVersion": 1,
    "namespace": "river.user",
    "indexFilterSet": false,
    "parsedQuery": {
      "$and": [
        {
          "sex": {
            "$eq": 1
          }
        },
        {
          "username": {
            "$eq": "liqingjiang"
          }
        }
      ]
    },
    "winningPlan": {
      "stage": "SORT",
      "sortPattern": {
        "createTime": -1
      },
      "inputStage": {
        "stage": "SORT_KEY_GENERATOR",
        "inputStage": {
          "stage": "FETCH",
          "filter": {
            "sex": {
              "$eq": 1
            }
          }
        },
        "inputStage": {
          "stage": "IXSCAN",
```

```

        "keyPattern": {
            "username": 1,
            "age": -1
        },
        "indexName": "IDX_USERNAME_AGE",
        "isMultiKey": false,
        "multiKeyPaths": {
            "username": [ ],
            "age": [ ]
        },
        "isUnique": false,
        "isSparse": false,
        "isPartial": false,
        "indexVersion": 2,
        "direction": "forward",
        "indexBounds": {
            "username": [
                ["\liqingjiang", "\liqingjiang"]
            ],
            "age": [
                ["MaxKey", "MinKey"]
            ]
        }
    }
}

},
"rejectedPlans": [ ]
},
"executionStats": {
    "executionSuccess": true,
    "nReturned": 1,
    "executionTimeMillis": 0,
    "totalKeysExamined": 1,
    "totalDocsExamined": 1,
    "executionStages": {
        "stage": "SORT",
        "nReturned": 1,
        "executionTimeMillisEstimate": 0,
        "works": 5,
        "advanced": 1,
        "needTime": 3,
        "needYield": 0,
        "saveState": 0,
        "restoreState": 0,
        "isEOF": 1,
        "invalidates": 0,
        "sortPattern": {

```

```
"createTime": -1
},
"memUsage": 157,
"memLimit": 33554432,
"inputStage": {
  "stage": "SORT_KEY_GENERATOR",
  "nReturned": 1,
  "executionTimeMillisEstimate": 0,
  "works": 3,
  "advanced": 1,
  "needTime": 1,
  "needYield": 0,
  "saveState": 0,
  "restoreState": 0,
  "isEOF": 1,
  "invalidates": 0,
  "inputStage": {
    "stage": "FETCH",
    "filter": {
      "sex": {
        "$eq": 1
      }
    }
  },
  "nReturned": 1,
  "executionTimeMillisEstimate": 0,
  "works": 2,
  "advanced": 1,
  "needTime": 0,
  "needYield": 0,
  "saveState": 0,
  "restoreState": 0,
  "isEOF": 1,
  "invalidates": 0,
  "docsExamined": 1,
  "alreadyHasObj": 0,
  "inputStage": {
    "stage": "IXSCAN",
    "nReturned": 1,
    "executionTimeMillisEstimate": 0,
    "works": 2,
    "advanced": 1,
    "needTime": 0,
    "needYield": 0,
    "saveState": 0,
    "restoreState": 0,
    "isEOF": 1,
    "invalidates": 0,
    "keyPattern": {
```

```

        "username": 1,
        "age": -1
    },
    "indexName": "IDX_USERNAME_AGE",
    "isMultiKey": false,
    "multiKeyPaths": {
        "username": [ ],
        "age": [ ]
    },
    "isUnique": false,
    "isSparse": false,
    "isPartial": false,
    "indexVersion": 2,
    "direction": "forward",
    "indexBounds": {
        "username": [
            "[\"liqingjiang\", \"liqingjiang\"]"
        ],
        "age": [
            "[MaxKey, MinKey]"
        ]
    },
    "keysExamined": 1,
    "seeks": 1,
    "dupsTested": 0,
    "dupsDropped": 0,
    "seenInvalidated": 0
    }
}
}
}
},
"serverInfo": {
    "host": "localhost.localdomain",
    "port": 27017,
    "version": "3.4.7",
    "gitVersion": "cf38c1b8a0a8dca4a11737581beafe4fe120bcd"
},
"ok": 1
}

```

### queryPlanner:

**namespace**: 该query所查询的表

**indexFilterSet**: 该query是否有indexfilter

**parsedQuery**: 翻译后的查询条件

**winningPlan**: 查询优化器针对该query所返回的最优执行计划的详细内容

**stage**: 最优执行计划的stage, 这里返回是FETCH, 可以理解为通过返回的index位置去检索具体的文档

**inputStage** : 用来描述子stage, 并且为其父stage提供文档和索引关键字

**keyPattern** : 所扫描的index内容

**indexName** : winning plan所选用的index 名称

**isMultiKey** : 是否是Multikey, 此处返回是false, 如果索引建立在array上, 此处将是true

**isUnique** : 是否是唯一索引

**direction** : 此query的查询顺序, 此处是forward, 如果用了.sort({username:-1})将显示backward

**indexBounds** : winningplan所扫描的索引范围,如果没有制定范围就是[MaxKey, MinKey]

**rejectedPlans** : 其他执行计划(非最优而被查询优化器reject的)的详细返回, 其中具体信息与winningPlan的返回中意义相同

### executionStats:

**executionSuccess** : 是否执行成功

**nReturned** : 查询的返回条数

**executionTimeMillis** : 整体执行时间

**totalKeysExamined** : 索引扫描条目

**totalDocsExamined** : 扫描document条目

对于一个查询, 我们最理想的状态是:

**nReturned = totalKeysExamined = totalDocsExamined**

### executionStages

**stage** : 执行计划的stage

**nReturned** : 查询的返回条数

**executionTimeMillisEstimate** : 该查询根据index去检索document获得数据的时间

**inputStage** :

**stage** : child stage, 此处是IXSCAN, 表示进行的是index scanning

**nReturned** : 条查询返回的条目

**executionTimeMillisEstimate** : 该查询扫描行index所用时间

### stage状态分析

是什么影响到了totalKeysExamined和totalDocsExamined?

是stage的类型。类型列举如下:

**COLLSCAN**: 全表扫描

**IXSCAN**: 索引扫描

**FETCH**: 根据索引去检索指定document

**SHARD\_MERGE**: 将各个分片返回数据进行merge

**SORT**: 表明在内存中进行了排序

**LIMIT**: 使用limit限制返回数

**SKIP**: 使用skip进行跳过

**IDHACK**: 针对\_id进行查询

**SHARDING\_FILTER**: 通过mongos对分片数据进行查询

**COUNT**: 利用db.coll.explain().count()之类进行count运算

**COUNTSCAN**: count不使用Index进行count时的stage返回

**COUNT\_SCAN**: count使用了Index进行count时的stage返回

**SUBPLA**: 未使用到索引的\$or查询的stage返回

**TEXT**: 使用全文索引进行查询时候的stage返回

**PROJECTION**: 限定返回字段时候stage的返回

对于普通查询：

我希望看到stage的组合(查询的时候尽可能用上索引):

**Fetch+IDHACK**

**Fetch+ixscan**

**Limit+ (Fetch+ixscan)**

**PROJECTION+ixscan**

**SHARDING\_FILTER+ixscan**

**COUNT\_SCAN**

不希望看到包含如下的stage:

**COLLSCAN**(全表扫描),

**SORT**(使用sort但是无index),

不合理的**SKIP**,

**SUBPLA**(未用到index的\$or),

**COUNTSCAN**(不使用index进行count)

```
{
  "queryPlanner" : {
    "plannerVersion" : 1,
    "namespace" : "river.user",
    "indexFilterSet" : false,
    "parsedQuery" : {
      "$and" : [
        {
          "sex" : {
            "$eq" : 1
          }
        },
        {
          "username" : {
            "$eq" : "liqingjiang"
          }
        }
      ]
    },
    "winningPlan" : {
      "stage" : "SORT",
      "sortPattern" : {
        "createTime" : -1
      },
      "inputStage" : {
        "stage" : "SORT_KEY_GENERATOR",
        "inputStage" : {
          "stage" : "FETCH",
          "filter" : {
            "sex" : {
              "$eq" : 1
            }
          }
        },
        "inputStage" : {
          "stage" : "IXSCAN",
          "keyPattern" : {
            "username" : 1,
            "age" : -1
          },
          "indexName" : "IDX_USERNAME_AGE",
          "isMultiKey" : false,
          "multiKeyPaths" : {
            "username" : [ ],
            "age" : [ ]
          },
          "isUnique" : false,
          "isSparse" : false,
          "isPartial" : false,
          "indexVersion" : 2,
          "direction" : "forward",
          "indexBounds" : {
            "username" : [
              ["liqingjiang", "liqingjiang"]
            ],
            "age" : [
              [MaxKey, MinKey]
            ]
          }
        }
      }
    },
    "rejectedPlans" : [ ]
  },
  "executionStats" : {
    "executionSuccess" : true,
    "nReturned" : 1,
    "executionTimeMillis" : 0,
    "totalKeysExamined" : 1,
    "totalDocsExamined" : 1,
    "executionStages" : {
      "stage" : "SORT",
      "nReturned" : 1,
      "executionTimeMillisEstimate" : 0,
      "works" : 5,
      "advanced" : 1,
      "needTime" : 3,
      "needYield" : 0,
      "saveState" : 0,
      "restoreState" : 0,
      "isEOF" : 1
    }
  }
}
```

```

    "invalidates" : 0,
    "sortPattern" : {
      "createTime" : -1
    },
    "memUsage" : 157,
    "memLimit" : 33554432,
    "inputStage" : {
      "stage" : "SORT_KEY_GENERATOR",
      "nReturned" : 1,
      "executionTimeMillisEstimate" : 0,
      "works" : 3,
      "advanced" : 1,
      "needTime" : 1,
      "needYield" : 0,
      "saveState" : 0,
      "restoreState" : 0,
      "isEOF" : 1,
      "invalidates" : 0,
      "inputStage" : {
        "stage" : "FETCH",
        "filter" : {
          "sex" : {
            "$eq" : 1
          }
        },
        "nReturned" : 1,
        "executionTimeMillisEstimate" : 0,
        "works" : 2,
        "advanced" : 1,
        "needTime" : 0,
        "needYield" : 0,
        "saveState" : 0,
        "restoreState" : 0,
        "isEOF" : 1,
        "invalidates" : 0,
        "docsExamined" : 1,
        "alreadyHasObj" : 0,
        "inputStage" : {
          "stage" : "IXSCAN",
          "nReturned" : 1,
          "executionTimeMillisEstimate" : 0,
          "works" : 2,
          "advanced" : 1,
          "needTime" : 0,
          "needYield" : 0,
          "saveState" : 0,
          "restoreState" : 0,
          "isEOF" : 1,
          "invalidates" : 0,
          "keyPattern" : {
            "username" : 1,
            "age" : -1
          },
          "indexName" : "IDX_USERNAME_AGE",
          "isMultiKey" : false,
          "multiKeyPaths" : {
            "username" : [ ],
            "age" : [ ]
          },
          "isUnique" : false,
          "isSparse" : false,
          "isPartial" : false,
          "indexVersion" : 2,
          "direction" : "forward",
          "indexBounds" : {
            "username" : [
              "[\"liqingjiang\", \"liqingjiang\"]"
            ],
            "age" : [
              "[MaxKey, MinKey]"
            ]
          },
          "keysExamined" : 1,
          "seeks" : 1,
          "dupsTested" : 0,
          "dupsDropped" : 0,
          "seenInvalidated" : 0
        }
      }
    }
  },
  "serverInfo" : {
    "host" : "localhost.localdomain",
    "port" : 27017,
    "version" : "3.4.7",
    "gitVersion" : "cf38c1b8a0a8dca4a11737581beafef4fe120bcd"
  },
  "ok" : 1
}

```

```

> db.user.find({age:26}).explain("executionStats")
{
  "queryPlanner" : {
    "plannerVersion" : 1,
    "namespace" : "river.user",
    "indexFilterSet" : false,
    "parsedQuery" : {
      "age" : {
        "$eq" : 26
      }
    },
    "winningPlan" : {
      "stage" : "COLLSCAN",
      "filter" : {
        "age" : {
          "$eq" : 26
        }
      },
      "direction" : "forward"
    },
    "rejectedPlans" : [ ]
  },
  "executionStats" : {
    "executionSuccess" : true,
    "nReturned" : 1,
    "executionTimeMillis" : 1027,
    "totalKeysExamined" : 0,
    "totalDocsExamined" : 2100002,
    "executionStages" : {
      "stage" : "COLLSCAN",
      "filter" : {
        "age" : {
          "$eq" : 26
        }
      },
      "nReturned" : 1,
      "executionTimeMillisEstimate" : 948,
      "works" : 2100004,
      "advanced" : 1,
      "needTime" : 2100002,
      "needYield" : 0,
      "saveState" : 16441,
      "restoreState" : 16441,
      "isEOF" : 1,
      "invalidates" : 0,
      "direction" : "forward",
      "docsExamined" : 2100002
    },
    "serverInfo" : {
      "host" : "localhost.localdomain",
      "port" : 27017,
      "version" : "3.4.7",
      "gitVersion" : "cf38c1b8a0a8dca4a11737581beafef4fe120bcd"
    },
    "ok" : 1
  }
}

```

```

>
>
> db.user.find({username:"liqingjiang", age:26}).explain("executionStats")
{
  "queryPlanner" : {
    "plannerVersion" : 1,
    "namespace" : "river.user",
    "indexFilterSet" : false,
    "parsedQuery" : {
      "$and" : [
        {
          "age" : {
            "$eq" : 26
          }
        },
        {
          "username" : {
            "$eq" : "liqingjiang"
          }
        }
      ]
    },
    "winningPlan" : {
      "stage" : "FETCH",
      "inputStage" : {
        "stage" : "IXSCAN",
        "keyPattern" : {
          "username" : 1,
          "age" : -1
        },
        "indexName" : "IDX_USERNAME_AGE",
        "isMultiKey" : false,
        "multiKeyPaths" : {
          "username" : [ ],
          "age" : [ ]
        },
        "isUnique" : false,

```



```

        "isSparse" : false,
        "isPartial" : false,
        "indexVersion" : 2,
        "direction" : "forward",
        "indexBounds" : {
            "username" : [
                "\liqingjiang\", \"liqingjiang\""
            ],
            "age" : [
                [26.0, 26.0]
            ]
        }
    },
    "rejectedPlans" : [ ]
},
"executionStats" : {
    "executionSuccess" : true,
    "nReturned" : 1,
    "executionTimeMillis" : 70,
    "totalKeysExamined" : 1,
    "totalDocsExamined" : 1,
    "executionStages" : {
        "stage" : "FETCH",
        "nReturned" : 1,
        "executionTimeMillisEstimate" : 0,
        "works" : 2,
        "advanced" : 1,
        "needTime" : 0,
        "needYield" : 0,
        "saveState" : 0,
        "restoreState" : 0,
        "isEOF" : 1,
        "invalidates" : 0,
        "docsExamined" : 1,
        "alreadyHasObj" : 0,
        "inputStage" : {
            "stage" : "IXSCAN",
            "nReturned" : 1,
            "executionTimeMillisEstimate" : 0,
            "works" : 2,
            "advanced" : 1,
            "needTime" : 0,
            "needYield" : 0,
            "saveState" : 0,
            "restoreState" : 0,
            "isEOF" : 1,
            "invalidates" : 0,
            "keyPattern" : {
                "username" : 1,
                "age" : -1
            },
            "indexName" : "IDX_USERNAME_AGE",
            "isMultiKey" : false,
            "multiKeyPaths" : {
                "username" : [ ],
                "age" : [ ]
            },
            "isUnique" : false,
            "isSparse" : false,
            "isPartial" : false,
            "indexVersion" : 2,
            "direction" : "forward",
            "indexBounds" : {
                "username" : [
                    "\liqingjiang\", \"liqingjiang\""
                ],
                "age" : [
                    [26.0, 26.0]
                ]
            },
            "keysExamined" : 1,
            "seeks" : 1,
            "dupsTested" : 0,
            "dupsDropped" : 0,
            "seenInvalidated" : 0
        }
    }
},
"serverInfo" : {
    "host" : "localhost.localdomain",
    "port" : 27017,
    "version" : "3.4.7",
    "gitVersion" : "cf38c1b8a0a8dca4a11737581beafef4fe120bcd"
},
"ok" : 1
}
>

```

