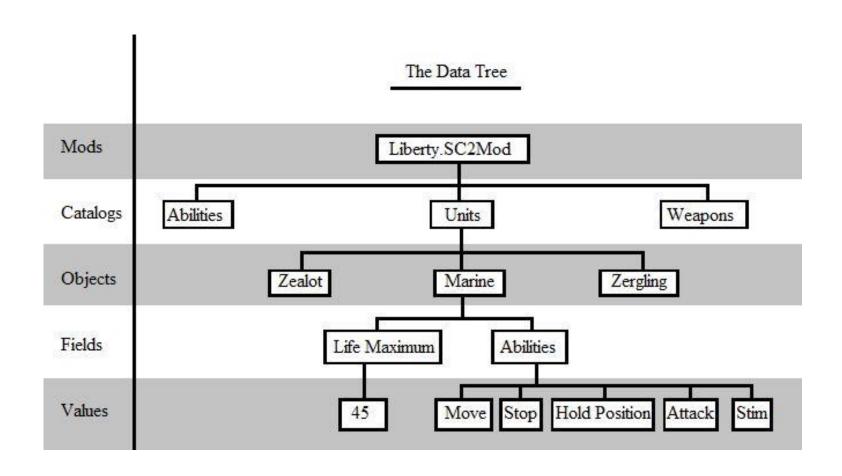
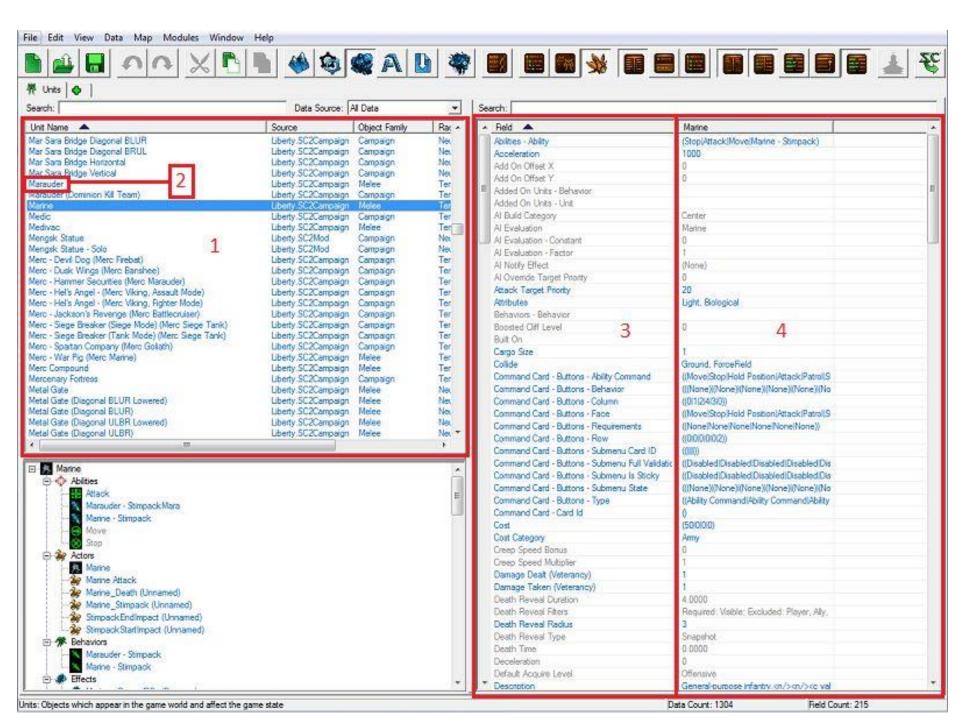
策划配置系统

Agenda

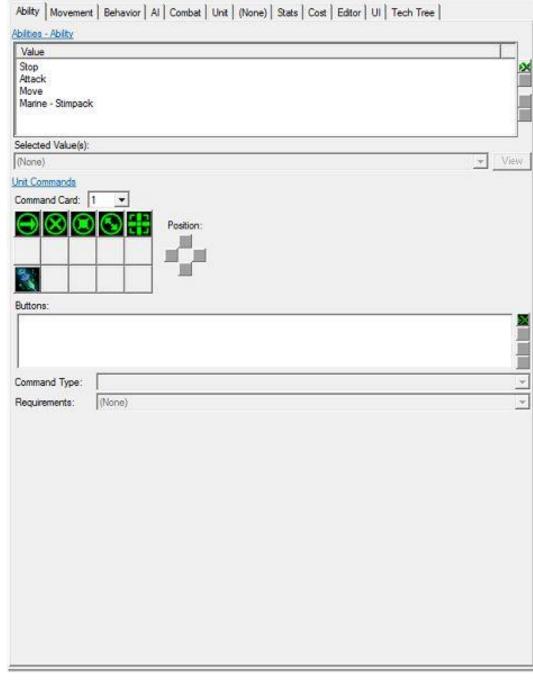
- •《星际争霸2》《极度恐慌》《神秘海域》的策划配置
- Configgen功能介绍
 - 8个方面
- 生成java, lua代码
 - Java 关注安全
 - Lua 关注启动速度和内存
- Configgen大致实现

星际争霸2-Data Module





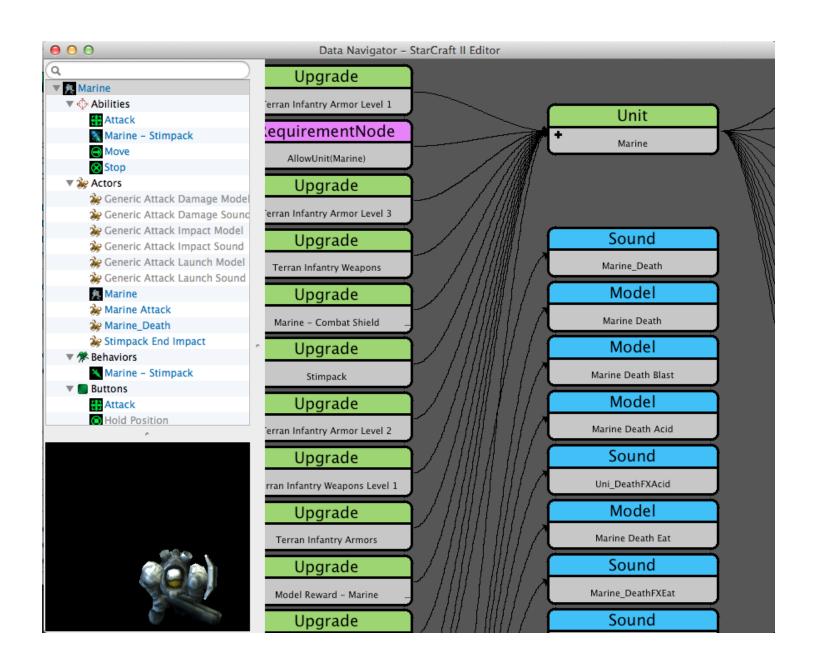
- 1. Catalog
- 2. Object
- 3. Field
- 4. Value



Detail View

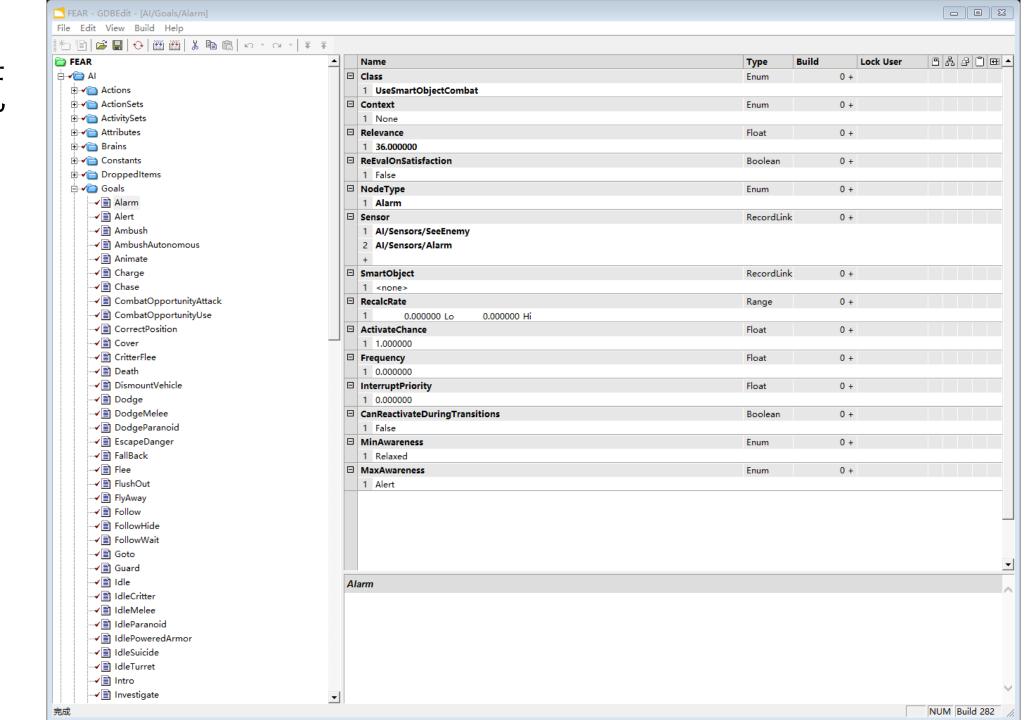
```
LibertyMulti.SC2Mod Liberty.SC2Mod Core.SC2Mod
Liberty.SC2Campaign
          <ChanceArray index="Idle" value="33"/>
          <ChanceArray index="Turn" value="33"/>
      </Fidget>
  </CUnit>
 <CUnit id="Marine"
      <DeathRevealRadius value="3"/>
      <Race value="Terr"/>
      <Mob value="Multiplayer"/>
      <LifeStart value="45"/>
      <LifeMax value="45"/>
      <LifeArmorName value="Unit/LifeArmorName/TerranInfantrvArmor"/>
      <Speed value="2.25"/>
      <Acceleration value="1000"/>
      <LateralAcceleration value="46.0625"/>
      <StationaryTurningRate value="999.8437"/>
      <TurningRate value="999.8437"/>
      <Food value="-1"/>
      <CostCategory value="Army"/>
      <CostResource index="Minerals" value="50"/>
      <RepairTime value="20"/>
      <a href="AttackTargetPriority value="20"/>
      <DamageDealtXP value="1"/>
      <DamageTakenXP value="1"/>
      <KillXP value="10"/>
      <Radius value="0.375"/>
      <SeparationRadius value="0.375"/>
      <InnerRadius value="0.375"/>
      <CargoSize value="1"/>
      <ScoreMake value="50"/>
      <ScoreKill value="100"/>
      <ScoreResult value="BuildOrder"/>
      <SubgroupPriority value="15"/>
      <MinimapRadius value="0.375"/>
      <FlagArray index="PreventDestroy" value="1"/>
      <FlagArray index="UseLineOfSight" value="1"/>
      <PlaneArray index="Ground" value="1"/>
      <Collide index="Ground" value="1"/>
      <Collide index="ForceField" value="1"/>
      <Sight value="9"/>
      <Abilarray Link="stop"/>
      <abilarray Link="attack"/>
      <Abilarray Link="move"/>
      <Abilarray Link="Stimpack"/>
      <CardLayouts>
          <LayoutButtons Face="Move" Type="AbilCmd" AbilCmd="move, Move
```

XML View UnitData.xml



极度恐慌 FEAR

Game Database



Alarm record		aigoals	schema		≣ aigoa	s.schema ×	≣ Alarr	m.record ×	
Alert record		a.goa.s	221121112		1 ([Schema] ≾	1 ([Record]	
Ambush record Ambush		**			2	Name=AI.Goals	2	Schema=AI.Goals	
Anbush record		Alarm	record		3	Parent=	3	Name=Alarm	
Ambush record 7 Typer-Times 1 1 1 1 1 1 1 1 1					4	Help=Defines an AI Goal record.	4	Comment=	
Ambush record 7 Typer-Times 1 1 1 1 1 1 1 1 1		Alert	record	文件	5		5	 VirtualRelativeCategory=	
AmbushAutonomous record AmbushAutonomous record AmbushAutonomous record AmbushAutonomous record Animate record Animate record Charge record Charge record Charge record Charge record Charge record Compatibility Compatibi				∠ 11	6	[Attrib.Class]	6		
AmbushAutonomous record Animate record Animate record Charge record Charge record Charge record Charge record Chase record CombatOpportunityAttack record CombatOpportunityUse record CombatOpportunityUse record CorrectPosition record CorrectPosition record CritterRee record CritterRee record CritterRee record Desalth record CritterRee record Dodge record DimmuntVehicle record DimmuntVehicle record Dodge record D		Ambush	record		7	Type=Enum	7	[Attrib.Class]	
Animate record Animate record Animate record Charge record Charge record Charge record Chase record Chase record Chase record Chase record CombatOpportunityAttack record CombatOpp					8	Data=\aigoals.enum	8	Inherit=False	
Animate record Animate record Charge record Charge record Charge record Charge record Charge record CombatCpportunityAttack record CorectPosition record CorectPos	٦	AmbushAutonomous	record		9	Default=None	9	PlaceHolder=False	
Charge record 12 Cherrish.Context 13 Comment 13 Comment 14 Comment 14 Comment 15 Charge record 15 Type=Enum 15 Charge record 15 Type=Enum 15 Charge record 15 Comment 15 Charge record 16 Charge record 17 Values 18 Charge record 18 Charge record 18 Charge record 19 Charge		,			10	Values=1	10	Todo=False	
Charge record 13		Animata	record		11	Help=AIGoal Class (C++ class in code) that this Goal Type is base	11	Modified=False	
Charge record Chase record Chase record Chase record Chase record CombatOpportunityAttack record CombatOpportunityUse record CombatOpportunityUse record CorrectPosition record Cover record		Animate	record						
Chase record CombatOpportunityAtack record CombatOpportunityUse record CombatOpportunityUse record CorrectPosition record CorrectPosition record Cover					13				
CombatOpportunity/Attack record CombatOpportunity/Use record CombatOpportunity/Use record CorrectPosition record Cover recor		Charge	record					Value.0000=UseSmartObjectCombat	
CombatOpportunityAttack record CombatOpportunityUse record CombatOpportunityUse record CombatOpportunityUse record CombatOpportunityUse record CorrectPosition record CorrectPosition record Cover record Cover record Cover record CritterFlee record Death record Death record Dodge record DodgeMelee record DodgeMelee record DodgeMelee record DodgeParanoid record									
CombatOpportunityAttack record 19		Chase	record						
CombatOpportunityUse record CombatOpportunityUse record CorrectPosition record Schema Schema CorrectPosition record Cover record Cover record CritterFlee record Death record Death record DismountVehicle record DismountVehicle record Dodge record Type=Boot should recalculate relevance when it is satisfal tooks Dodge record Type=Boot should recalculate relevance when it is satisfal tooks Dodge record Type=Boot should recalculate relevance when it is satisfal tooks Dodge record Dodge record Type=Boot should recalculate relevance when it is satisfal tooks Dodge record Dodge record Type=Boot should recalculate relevance when it is satisfal tooks Comments All relep=Rule if goal should recalculate relevance when it is satisfal tooks Comments All relep=Rule if goal should recalculate relevance when it is satisfal tooks Comments All relep=Rule if goal should recalculate relevance when it is satisfal tooks Comments All reps=Rule Dodge record Type=Rule DodgeParanoid record EscapeDanger record Type=Rule									
CombatOpportunityUse record CorrectPosition record Cover record Cover record CitterFlee record Death record DismountVehicle record DismountVehicle record DismountVehicle record Dodge record Dodge record DodgeAranoid record DismountVehicle record DodgeAranoid record DodgeAranoid record DodgeAranoid record DodgeAranoid record DodgeAranoid record DodgeAranoid record EscapeDanger record FallBack record F		CombatOpportunityAttack	k record			Help=Optional AI Context that this Goal sets on activation.			
CorrectPosition record Schema CorrectPosition record Schema		,							
CorrectPosition record Schema Cover record 22 Befairte-8.8 Cover record 23 Defairte-8.8 Cover record 24 Defairte-8.8 Cover record 25 Defairte-8.8 CritterFlee record 25 Defairte-8.8 Death record 27 FlaceBolder-False 27 PlaceBolder-False 38 Values-1 Death record 38 Values-1 DismountVehicle record 38 Type-Root senue 39 Type-Type-Type-Type-Type-Type-Type-Type-		Combat Opportunity Use	record						
CorrectPosition record 23 Default=0.8 23 Calves-10.8 24 Calves-1 24 Calves-1 25 Calves-1 26 Calves-1 27 Calves-1 28 Calves		comparopportunityose	record	0 1					D 1
Cover record 25		CarrantDanition		Schema					Recora
Cover record 25		CorrectPosition	record						
CritterFlee		_						[Attmib DeFye]OpCeticfoction]	
CritterFlee record 27		Cover	record			netp-static intrinsic relevance value.		T -	
Death record 28						[Attnih BoEvalOnSatisfaction]			
Death record 29		CritterFlee	record						
Death record 39									
DismountVehicle record DismountVehicle record Signature Sig		Death	record						
DismountVehicle record 32 Dodge record 33 Type=Enum Type=En									
Dodge record 33 Cattrib.NodeType 33 Type=Enum 34 Type=Enum 35 Inherit=False 10 Inherit=Fal	٦	DismountVehicle	record						
Dodge		Distribution	record			[Attrib.NodeType]			
DodgeMelee record 35 Data:\ainodes.enum 35 Inherit=False PlaceHolder=False 77 Values=1 37 Todo=False 77 Todo=False 78 Modified=False 78 Modified=False 78 Modified=False 79 Lock= 79		Dadas						 [Attrib.NodeType]	
DodgeMelee record 36 Default=None 36 PlaceHolder=False 37 Todo=False 37 Todo=False 38 Modified=False 38 Modified=False 39 Lock= 48 Comment= 41 Type=RecordLink 41 Data=Public AI. Sensors 42 Values=-1 43 (Attrib. Sensor) 44 Inherit=False 45 PlaceHolder=False 45 P		Dodge	record						
DodgeParanoid record 37 Values=1 37 Todo=False DodgeParanoid record 38 CHelp=Type of AlNode. 38 Modified=False									
DodgeParanoid record 39 Lock=		DodgeMelee	record		37	Values=1	37	Todo=False	
EscapeDanger record 41 Type=RecordLink 41 Value.0000=Alarm FallBack record 43 Values=-1 43 [Attrib.Sensor] Flee record 45 [Attrib.Sensor] 46 Type=RecordLink 47 Type=RecordLink 48 Data=Public AI.Sensors for this goal. 49 PlaceHolder=False 45 PlaceHolder=False 45 PlaceHolder=False 46 Todo=False 47 Type=RecordLink 47 Type=RecordLink 48 Data=Public AI.SmartObjects 48 Lock= FlyAway record 58 Unicode=False 58 Value.0000=AI/Sensors/SeeEnemy					38	Help=Type of AINode.	38	Modified=False	
EscapeDanger record 41 Type=RecordLink 41 Data=Public AI.Sensors 42 FallBack record 43 Values=-1 43 [Attrib.Sensor] Flee record 45 [Attrib.SmartObject] 46 [Attrib.SmartObject] 47 Type=RecordLink 46 Data=Public AI.SmartObjects 48 Data=Public AI.SmartObjects 48 Lock= FlyAway record 58 Unicode=False 58 Value.0000=Alrm 41 Value.0000=Alarm 42 Value.0000=Alarm 43 [Attrib.Sensor] 44 Inherit=False 45 PlaceHolder=False 46 Todo=False 47 Modified=False 48 Lock= 49 Comment= Value.0000=AI/Sensors/SeeEnemy		DodgeParanoid	record		39		39	Lock=	
FallBack record 42 Data=Public AI.Sensors 43 Values=-1 44 Help=Required sensors for this goal. 45 Flee record 46 [Attrib.SmartObject] 47 Type=RecordLink FlushOut record 48 Data=Public AI.SmartObjects 49 Default= <none> 49 Default=<none> 41 Inherit=False 42 [Attrib.Sensor] 44 Inherit=False 45 PlaceHolder=False 46 Todo=False 47 Modified=False 48 Lock= 49 Comment= FlyAway record 50 Value.0000=AI/Sensors/SeeEnemy</none></none>					40	[Attrib.Sensor]	40	Comment=	
FallBack record 42 Data=Public AI.Sensors 42 Values=-1 43 Values=-1 44 Help=Required sensors for this goal. 44 Help=Required sensors for this goal. 45 PlaceHolder=False 46 Todo=False FlushOut record 48 Data=Public AI.SmartObject] 40 Todo=False 41 Modified=False 42 [Attrib.Sensor] 43 Type=RecordLink 44 Inherit=False 45 PlaceHolder=False 46 Todo=False 47 Type=RecordLink 47 Modified=False 48 Lock= 49 Default= <none> 49 Comment= 49 Value.0000=AI/Sensors/SeeEnemy</none>		EscapeDanger	record		41	Type=RecordLink	41	Value.0000=Alarm	
Flee record 44 Help=Required sensors for this goal. 44 Inherit=False 45 PlaceHolder=False 46 Todo=False 47 Type=RecordLink FlushOut record 48 Data=Public AI.SmartObjects 49 Default= <none> FlyAway record 50 Value.0000=AI/Sensors/SeeEnemy</none>					42	Data=Public AI.Sensors	42		
Flee record 45 46 [Attrib.SmartObject] FlushOut record 48 Data=Public AI.SmartObjects 49 Default= <none> 49 Comment= FlyAway record 40 Inherit=False 41 Inherit=False 42 FlaceHolder=False 43 Todo=False 44 Inherit=False 45 PlaceHolder=False 46 Todo=False 47 Modified=False 48 Lock= 49 Comment= 50 Value.0000=AI/Sensors/SeeEnemy</none>	٦	FallBack	record		43	Values=-1	43	[Attrib.Sensor]	
Flee record 46 [Attrib.SmartObject] 46 Todo=False Type=RecordLink 47 Modified=False FlushOut record 48 Data=Public AI.SmartObjects 48 Lock= FlyAway record 50 Unicode=False 50 Value.0000=AI/Sensors/SeeEnemy		. SDOCK	record		44	Help=Required sensors for this goal.	44	Inherit=False	
FlushOut record 47 Type=RecordLink Data=Public AI.SmartObjects 48 Lock= 49 Default= <none> 49 Comment= FlyAway record 50 Unicode=False 50 Value.0000=AI/Sensors/SeeEnemy</none>		Elec			45		45	PlaceHolder=False	
FlushOut record 48 Data=Public AI.SmartObjects 48 Lock= 49 Default= <none> 49 Comment= FlyAway record 50 Unicode=False 50 Value.0000=AI/Sensors/SeeEnemy</none>		riee	record		46	[Attrib.SmartObject]	46	Todo=False	
FlyAway record 49 Default= <none> 49 Comment= Value.0000=AI/Sensors/SeeEnemy</none>	4	F. 15.	-		47	Type=RecordLink	47	Modified=False	
FlyAway record 50 Unicode=False 50 Value.0000=AI/Sensors/SeeEnemy		FlushOut	record		48		48		
FlyAway record 50 Unicode=False 50 Value.0000=AI/Sensors/SeeEnemy 51 Deleted=False 51 Value.0001=AI/Sensors/Alarm									
51 Deleted=False 51 QValue.0001=AI/Sensors/Alarm		FlyAway	record						
					51	Deleted=False	51	⊃Value.0001=AI/Sensors/Alarm	

总结

• 以Record为单位来配置,Field都可配置默认值

• 星际用的.xml可以是任意复杂组合的结构,而FEAR用的.ini在基础平面结构上添加了列表.数组的支持

• 都有schema的定义,编辑器则都或多或少由schema自动生成

• 都提供了record之间关联的功能

神秘海域-Data Compiler

```
(state ("breaking")
                                                       (on (begin)
(define-state-script ("falling-sign")
                                                         [spawn-particles-at-joint "self"
 (state ("untouched")
                                                           "hinge"
   (on (update)
                                                           "sign-break-dust"]
      [when [task-complete? "wz-post-combat"]
                                                         [wait-animate "self" "sign-break"]
        [go "fallen"]
                                                         [go "fallen"]
   (on (event "hanging-from")
                                                     (state ("fallen")
      [go "breaking"]
                                                       (on (begin)
                                                         [animate "self" "sign-broken"] ;; looping
```

```
(new ai-weapon-skill
   ;; weapon定义art, FX, sounds。type定义使用哪些Animation
   :weapon 'assault-rifle-b
   :type (ai-weapon-anim-type machine-gun)
   ;;伤害,分为对人和对物
   ;; damage parms
   :character-shot-damage 5
   :object-shot-damage 120
   ;; 定义射击pattern, 射击间隔, 每次射几发子弹
   ;; rate of fire parms
   :initial-sequence-delay (rangeval 0.0 0.0)
   :num-bursts-per-sequence (rangeval-int 10000 10000)
   :auto-burst-delay (rangeval 0.4 0.8)
   :auto-burst-shot-count (rangeval-int 3 5)
   :single-burst-chance 0.33
   :single-burst-delay (rangeval 0.4 0.8)
   :single-burst-shot-count (rangeval-int 1 3)
   :single-burst-fire-rate (rangeval 0.16 0.20)
   ;;根据距离来调整准确度,越近越准确
   ;; accuracy parms
   :accuracy-curve *accuracy-assault-rifle-upgrade*
   ;;玩家从掩体探出头后的3.5秒内,这个枪的准确度从0,慢慢恢复到正常
   :time-to-accurate-cover 3.5
   :accuracy-cover-best 1.0
   :accuracy-cover-worst 0.0
```

总结2

• 星际由xml和galaxy脚本构成

• FEAR则不用脚本

• 神秘海域则都是lisp脚本,数据在脚本里

策划配置

• Script 脚本

• Xml 树结构,手工配置或工具生成

• Csv 表格结构

1: 每列定义程序用名和类型

- 自动生成加载代码
- 策划可以检验所填数据是否符合类型

• 支持list, map (武林1/10是list, 1/150是map)

2: 每张表有主键和唯一键

• 生成根据键值来找到行的代码, 提高了查找效率

```
table name="npc.monster" own="effecteditor, client" primaryKey="MonsterID"

public static Monster get(int monsterID) {
   config.ConfigMgr mgr = config.ConfigMgr.getMgr();
   return mgr.npc_monster_All.get(monsterID);
}
```

• 支持主键有多个Key(武林有1/15的table使用)

3: 可配置表之间的索引关系

- 自动生成ref, nullableRef代码
- 策划可检验所填数据是否符合这个索引约束

```
<column desc="对应CharModel的Id" name="CharModelId" own="client"
    ref="model.charmodel" type="int"/>

<column desc="普攻技能Id" name="NormalSkillID" ref="skill.skill" type="int"/>
<column desc="技能IID" name="SkillIDList" ref="skill.skill" type="list, int, 4"/>
```

```
**

* 普攻技能Id

*/

public int getNormalSkillID() { return normalSkillID; }

public config. skill. Skill refNormalSkillID() { return RefNormalSkillID; }

* 技能IID

*/

public java.util.List<Integer> getSkillIDList() { return skillIDList; }

public java.util.List<config.skill.Skill> refSkillIDList() { return RefSkillIDList; }
```

3.1: 可配置索引到另一表多行, listRef

- 策划可以把一个列很多的表拆成2个, 变成多行来减少列数
- 对程序来说,代码不变

```
<foreignKey keys="Id" name="Attr" ref="inspiration.attr, Type" refType="LIST"/>

public java.util.List<config.inspiration.Attr> listRefAttr() {
    return ListRefAttr;
}
```

```
ref="equip.equipset,SetId" refType="LIST" type="int"/>
ref="lifeplate.shufflequality,QualityGroup" refType="LIST" type="int"/>
ref="lifeplate.shuffleattr,ShuffleSlot" refType="LIST" type="int"/>
ref="pet.petcatchpool,Id" refType="LIST" type="int"/>
```

4: 类型支持自定义结构, 多态结构

• 策划可更灵活的配置,同时兼具类型检测,索引检测这些功能

R	S	T	
完成条件详见	完成参数1	完成参数2	完店
completecond	P1	P2	Р3
TalkNpc	13034	1	
WorldShout	嘿兄弟我们好久不见		
TalkNpc	13034	131002	
FindNpc	13035		
FindNpc	13035		
FindNpc	13035		
TalkNpc	13035	111007	
MirrorKillMons	10083		
TalkNpc	13035	111008	
TalkNpc	13559	13100850	
ReachPoint	zc01qixiazhen_task_luji	anbuping	
KAC IZUKA	40040		

武林的Bean

- 概念上有个合理的分层
- 增加了跨表的一致性
- 方便程序统一处理

```
<bean compress=";" name="Drop" own="client">
    <column desc="物品编号" name="itemid" own="client"
       ref="item.commonitem" type="int"/>
    <column desc="数量" name="num" own="client" type="int"/>
</bean>
<bean name="DropItemInfo">
    <column desc="掉落类型" name="droptype" type="int"/>
    <column desc="物品" name="itemid" range="1,2000000000" type="int"/>
    <column desc="掉落概率" name="droprate" type="float"/>
    <column desc="数量" name="count" range="1,200000" type="int"/>
    <column desc="是否珍稀物品" name="isprecious" type="int"/>
</bean>
<bean name="DropItemInfoForShow" own="client">
    <column desc="掉落类型" name="droptype" own="client" type="int"/>
    <column desc="物品" name="itemid" own="client"
       range="1,2000000000" type="int"/>
   <column desc="数量" name="count" own="client" range="1,200000" type="int"/>
</bean>
<bean name="DropList" own="client">
    <column compress="#" desc="普通道具奖励" name="common" own="client" type="list,Drop"/>
    <column compress="#" desc="剑客道具奖励" name="JianKe" own="client" type="list,Drop"/>
    <column compress="#" desc="枪豪道具奖励" name="QiangHao" own="client" type="list,Drop"/>
    <column compress="#" desc="医师道具奖励" name="YiShi" own="client" type="list,Drop"/>
    <column compress="#" desc="术士道具奖励" name="ShuShi" own="client" type="list,Drop"/>
    <column compress="#" desc="神机" name="ShenJi" own="client" type="list,Drop"/>
    <column compress="#" desc="扩展职业1" name="ExtProfession1"
       own="client" type="list,Drop"/>
    <column compress="#" desc="扩展职业2" name="ExtProfession2"
       own="client" type="list,Drop"/>
    <column compress="#" desc="扩展职业3" name="ExtProfession3"
       own="client" type="list,Drop"/>
    <column compress="#" desc="男性奖励" name="man" own="client" type="list,Drop"/>
    <column compress="#" desc="女性奖励" name="woman" own="client" type="list,Drop"/>
    <column compress=";" desc="称号道具" name="TitleList" own="client"
       ref="item.commonitem" type="list,int"/>
</bean>
```

武林的多态bean

```
<bean name="achievement.completecondition">
    <bean name="FinishAchievement">
    <bean name="FinishTask">
    <bean name="FinishActivity">
    <bean name="RoleLevel">
    <bean name="HaveFriends">
<bean name="task.completecondition"</pre>
    <bean name="KillMonster">
    <bean name="TalkNpc">
    <bean name="CollectItem">
    <bean name="UseItem">
    <bean name="ReachPoint">
    <bean name="ReachPoints">
    <bean name="Dye">
    <bean name="GuardNpc">
    <bean name="ReachLevel">
```

```
<bean name="buff.BuffLogic" ">
   <bean name="Damage">
   <bean name="DamageModifier">
   <bean name="DamageImmune">
   <bean name="DamageAbsorbReflect">
   <bean name="Heal">
   <bean name="HealModifier">
   <bean name="Period">
   <bean name="AttrModifier">
   <bean name="God">
   <bean name="Immune">
   <bean name="Dispel">
   <bean name="Mark">
```

5: 单元格可写任意复合结构数据

• 灵活性进一步增加,等价于xml的表达能力了

<column name="itemid" type="int"/>
<column name="count" type="int"/>

</bean>

(/bean)

```
bean enumRef="task.completeconditiontype" name="task.completecondition">
    (bean name="KillMonster")
        <column name="monsterid" ref="monster" type="int"/>
                                                           程序用名字
        <column name="count" type="int"/>
                                                                                 completecondition param1
                                                                                                                                            param2
                                                           name
    </bean>
                                                           杀个怪
                                                                                 KillMonster
    和npc对话
                                                                                  TalkNpc
        <column name="npcid" type="int"/>
                                                           收集物品
                                                                                  CollectItem
                                                                                                                                         11
    </bean>
                                                           杀怪并且收集物品
                                                                                  ConditionAnd
                                                                                                   KillMonster(1.3)
                                                                                                                                            CollectItem(11.1)
    (bean name="Chat")
                                                           杀怪对话并且收集物品
                                                                                                   ConditionAnd(KillMonster(1.3), TalkNpc(1))
                                                                                 ConditionAnd
                                                                                                                                            CollectItem(11.1)
                                                           聊天并且杀怪
                                                                                                   Chat("葵花宝典,123")
                                                                                 ConditionAnd
                                                                                                                                            KillMonster(1,3)
        <column name="msg" type="string"/>
    </bean>
    (bean name="ConditionAnd")
        <column compressAsOne="1" name="cond1" type="task.completecondition"/>
        <column compressAsOne="1" name="cond2" type="task.completecondition"/>
    </bean>
    (bean name="CollectItem")
```

在excel一格中配置复杂结构

• 武林中有1/20的column用的单格压缩

• 旧的方案: 在bean上, 在column上配置compress, 使用不同的分割符来构造复杂结构

```
      普通道具奖励
      <bean compress=";" name="Drop" own="client">

      DropList@Common
      <column desc="物品编号" name="itemid" own="client"</td>

      518;4#511;1600
      <column desc="数量" name="num" own="client" type="int"/>

      518;4#511;1608

      518;4#511;1616
      <bean name="DropList" own="client">

      518;4#511;1624
      <column compress="#" desc="普通道具奖励" name="common" own="client" type="list,Drop"/>
```

缺点

• 嵌套的bean, list必须使用不同的分隔符

- 没法表示带递归的多态结构
 - 比如: ConditionAnd(cond1: Condition, cond2: Condition)
- 在bean上定义compress后所有用到这个bean的table都必须compress了。感觉compress不该是bean的属性,而应该是column的属性

解决方案:用()构成层级树结构

只在column上配置compressAsOne就好,不用再配置分隔符,都用逗号来分割

• 里面的bean,list用()扩起来,如果bean是多态,则()左边加上子bean名称

6: 支持定义枚举-避免魔数

- •程序可直接根据name找到表中一行,不需要根据magic number
- 分enum和enumPart, enum不支持服务器热更

<pre></pre>
<pre>own="effecteditor, client" primaryKey="Id"></pre>
<pre><column name="Id" own="client" type="int"></column></pre>
<pre><column desc="镜像副本" name="isMirror" own="client" type="bool"></column></pre>
<column <="" desc="跨服类型,参见crosstype.csv" name="CrossServerType" p=""></column>
<pre>own="client" ref="map.crosstype" type="int"/></pre>
《column desc="父活动ID六扇门练血堂有父" name="ParentActivityId"
ref="map.copyscene" refType="NULLABLE" type="int"/>
<pre><column desc="程序用名" name="Ename" own="client" type="string"></column></pre>

id	name	是否可叠加 (用于
id	name	canSuperposition
1	Damage	
2	Heal	
3	Period	
4	AttrModifie	TRUE
5	Damagelm	nmune
6	Immune	
7	Mark	TRUE
8	Stun	
9	Sleep	

武林配置中的枚举

id	name	是否可叠加	优先级 (动作 (没有	特效 (引用	显示进度第	移动限制	施法限制	策划说明	参数说明p1	p2	р3	p4
id	name	canSuperpo	priority	anim	sfx	hasbar	movedisal	skilldisable	d				
1	Damage								伤害, 共18个参数, 按	伤害百分比修正(0表示不造成伤害,	伤害百分日	根据类型	曾加修
2	Heal								治疗	治疗百分比(0表示不造成伤害, 100	附加攻击位	Ihp回复绝	₹hp匝
3	Period								持续	间隔时间毫秒	buff列表,	分号分割。	
4	AttrModifier	TRUE							战斗属性修改	属性1id,参考config.common.fight	属性1绝对	属性1百分	属性
5	Damagelmn	nune							掉血免疫	最小伤害	条件 (Trig	条件参数1	1条件
6	Immune								免疫	可免疫buff类别	免疫buff	免疫最大药	数量
7	Mark	TRUE							标记,暂时没用。某些技	组ld,表示一组标记逻辑,引用buf	排序ld,数	效值越小越	先
8	Stun		Į.	stun	buff_sfx_xu	TRUE	TRUE	TRUE	眩晕	是否必中			
9	Sleep		4	1 stun	buff_sfx_hu	TRUE	TRUE	TRUE	昏睡	是否必中			
10	Silent		3	3	buff_sfx_ch	TRUE		TRUE	沉默	是否必中			
11	Root		2	2	buff_sfx_ch	TRUE	TRUE		缠绕	是否必中			
12	Interrupt								打断当前技能	无			
13	Taunt								嘲讽	无			
14	Dispel								驱散	可驱散buff类别,subclass	可驱散buf	fl最大驱散	数量
									and the same of the factor	L V LL		1 11 14-	-77.414

全枚举的生成代码

```
public enum Rank {
    WHITE( name: "white", value: 1),
    GREEN( name: "green", value: 2),
    BLUE( name: "blue", value: 3),
    PURPLE( name: "purple", value: 4),
    YELLOW( name: "yellow", value: 5);

public config.equip.Rank_Detail ref() { return config.equip.Rank_Detail.get(value); }
```

```
public class Rank_Detail {
    private int rankID;
    private String rankName;
    private String rankShowName;
```

半枚举的生成代码

```
public class Jewelrysuit_Entry {
    public static Jewelrysuit_Entry SPECIALSUIT = new Jewelrysuit_Entry( name: "SpecialSuit", value: 4);

public config.equip.Jewelrysuit ref() { return config.equip.Jewelrysuit.get(value); }

public class Jewelrysuit {
    private int suitID;
    private String ename;
    private String name;
    private int ability1;
    private int ability1;
    private int ability1Value;
    private int ability2;
```

7: 更多的约束检测, 以及部分提取

- 策划可配置数字,字符串长度限制range,这样如果配错打表不通过
- CfgCheck.java这是个扩展点,策划可提要求来让程序支持更多约束检测,这样如果配错服务器不启动

```
《column desc="伪随机掉落周期(次数N的值,周期的意思根据宝箱类型)"name="FakeCycle"
range="1,1000" type="int"/>
```

- 通过own配置可以以column为单位提取部分配置数据,节省客户端内 存
- 也支持通过import配置,分serverconfig.xml, clientconfig.xml,和诛仙一样根据目录来单独生成部分数据。

8: 国际化支持

- 支持国际化到单语言
- 支持多国语言客户端切换, 并登陆同一个服务器
- 类型从string改为text
- 多国语言支持,需要服务器记录下此用户的所用语言,然后发送 比如公告协议时,自动选择对应语言。(text字段配置上保存这 对应的多国语言,gm平台工具也得支持多国语言)

列数太多怎么办?

- 一个复杂的树结构 如何拆分到多个表, 使列数不太多?
 - 切割bean,把一个bean分成多个,共享相同的primary key,通过此key相连
 - 切割bean里的list
bean2>,每个bean2在另一个table中,bean2里配置一个column为bean的primary key,然后在bean的primary key上配置ref, refType="LIST",与bean2相连

武林配置的schema统计 (20200428)

- 706个Bean
 - 220个正常Bean
 - 23个多态Bean 差不多500个子Bean
- 1429个Table (全部都有Primary Key)
 - 92个多列为主键
 - 217个全枚举, Enum
 - 162个半枚举, EnumPart
 - 8个Unique Key
- 9504个Column
 - 2431个外键约束, Foreign Key, ref
 - 527个是NULLABLE
 - 15个是LIST
 - 930个是list, 61个map
 - 512个配置了只占excel一格, compress(之后都用compressAsOne)
 - 9个配置了取值范围约束, Range

生成代码

- 会直接生成Record Link的访问代码
 - refXxx
 - nullableRefXxx
 - listRefXxx
- 对配置的查询比如config.item.Commonitem.get(itemId), 只应存在在协议的处理函数啊这些入口, 内部的函数里尽量不要有配置查询, 因为这些link访问代码已经生成了

生成java--关注安全

- 读取配置分2阶段
 - Read 读取配置数据
 - Resolve 外键,检验数据约束
 - 如果refXxx,使用时可不用判null(因为resolve阶段会抛异常),如果是nullableRef 则要判null

生成java

- 所有的配置有一个统一的入口
 - reload时多线程会正确一点

```
public class ConfigMgr {
    private static volatile ConfigMgr mgr;

public static ConfigMgr getMgr() { return mgr; }

public static void setMgr(ConfigMgr newMgr) { mgr = newMgr; }

public final java.util.Map<Integer, config.equip.Jewelry> equip_jewelry_All = new java.util.LinkedHashMap<>();

public final java.util.Map<config.LevelRank, config.equip.Jewelryrandom> equip_jewelryrandom_All = new java.util.LinkedHashMap<>();
```

生成java

- 生成的java代码会附带schema (ConfigCodeSchema.java)
 - 1, 不用从生成的的访问类反射取结构
 - 2. 把枚举的具体值视为schema

```
private static Schema equip_rank() {
    SchemaEnum s2 = new SchemaEnum(false, true);
    s2.addValue("white", 1);
    s2.addValue("green", 2);
    s2.addValue("blue", 3);
    s2.addValue("purple", 4);
    s2.addValue("yellow", 5);
    return s2;
}

private static Schema equip_rank_Detail() {
    SchemaBean s2 = new SchemaBean(true);
    s2.addColumn("RankID", SchemaPrimitive.SInt);
    s2.addColumn("RankName", SchemaPrimitive.SStr);
    s2.addColumn("RankShowName", SchemaPrimitive.SStr);
    return s2;
}
```

生成java

• 生成的java二进制数据在数据头自带schema

• Reload时会比较代码code的schema是否和数据data的schema兼容

- 兼容给才能reload成功
 - 全枚举必须不变,但枚举里的具体属性可变
 - 半枚举只能增,不能减
 - 可增加table,不能减少table

生成lua—关注加载速度和内存最小化

```
local this = cfg.equip.customequip
local mk = cfg._mk.tαble(this, uniqkeys: { { "all", "get", 1 }, }, enumidx: nil, refs: {
   { "RefId", false, cfg.item.commonitem, "get", 1 },
   { "RefEquipAttr", false, cfg.equip.equipattr, "get", 3 }, },
   "id", -- int, #ID
    "name", -- string, 名称
   "equipAttr", -- int, 装备属性
   "refineLevel" -- int, 精炼等级
mk(120015, "枪豪", 61108, 8)
mk(120016, "剑客", 71108, 8)
mk(120017, "术士", 41108, 8)
mk(120018, "医师", 51108, 8)
mk(120028, "神机", 161108, 8)
mk(120029, "花雨", 171108, 8)
mk(120030, "暗影", 181108, 8)
return this
```

lua优化

- 最初是二进制存储然后再zip,启动时lua读取zip加载
- 上线前优化:数据存储到lua文件里,table用array。
 - 加载速度提高10倍, 从2.3s提高到0.24s,
- 把数据格式从{a=1,b=2,c=3}变成{1,2,3}(利用metatable,__index程 序接口不变),
 - 内存从42M优化到26M。

Lua优化

- 延迟加载lua,只有需要用到表的时候再require。比如调用cfg.item.commonitem.get(xxx)调用到.get时再去require "cfg.item.commonitem"表。
 - 可以提升加载速度和减少内存占用
- 2019年12月(上线1年半)数据:
 - 策划配表数据全部加载的话占用内存到99.2M了(luajit是99.2M,对应官方 lua是155.7M),需要优化

Lua优化

- 提取公共结构。在同一个表中共享。
 - 从99.2M优化到70.3M,优化掉了30M(只提取空table {} 就优化了10多M)
- 结构bean中所有bool类型数压缩成一个int。当然程序接口仍然不变。 比如其中一行是 {100, true, false, "abc", true, true}, 压缩后变成 {100, 0xb, "abc"}, 4个bool变成一个int。
 - 内存变为68.4M降了2M,不明显
- 列模式,对int,bool做压缩。当然程序接口仍然不变。如果一个表有5列10000行,那存成lua代码就是 5 行,每行的table里有10000,那么10000个bool,只用存10000/53=189个整数就够了.
 - 自动分析, 列模式可减内存时使用列模式, 内存占用从68.4M降为54.2M

Configgen的实现

- 4个树结构
 - Define
 - 对应config.xml
 - Data
 - 对应config目录下所有的csv文件,读出来是List<List<String>>
 - Type
 - 从Define中,解析出类型,建立好链接(外键)关系
 - Value
 - 根据Type把Data中的String,读取成带类型的数据,即包括基本类型数据int,string,bool,也包括bean,list,map结构数据。(包括一格复杂结构也要读取出来,隐藏compressAsOne这种细节)

处理流程

- 读取config.xml, csv文件, 生成FullDefine, FullType, Data。
- 然后根据Data, csv前2行里的信息来自动完善FullDefine, FullType (补充column, 猜测 type), 之后保存完善后的Define到config.xml, 同时让Data内含自己的FullType
- 如有部分提取,根据Full Define和own生成提取后SubType
- 根据SubType和Data生成Value, 检验实际数据的约束

• 根据SubType和Value生成各语言的代码和数据文件

杂项

- 客户端lua的热更新
 - 分了好几个.zip,而不是以.luac文件为单位,减少文件个数。
 - 但为了减少热更大小,对.zip, 热更系统只更新.zip中改变的.luac。

- Configgen还支持生成c#, 但不支持生成c++
 - 求贡献

QA