ET 框架学习笔记（二） - - 网络交互相关

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Contents

1 Net 网络交互相关：【服务端】

- 这次重构里，以前是 Model 里，生成系为非静态，这次全搬进热更新域里，生成系与方法全是静态的。
- 因为生成系全变成了静态，那么调用方法就成为比如：直接使用生成系的类名，与静态方法调用。

```
NetInnerComponent.Instance.HandleMessage(realActorId, response); // 等同于直接调用下面这句【这是它给出来的例子】
// 上面这种，就必须组件里，而非生成系里，已经申明了公用方法，否则用下面的
Session matchSession = NetInnerComponentSystem.Get(matchIPEndPoint);
```

1.1 NetInnerComponent: 【服务端】对不同进程的处理组件。是服务器的组件

```
namespace ET.Server {
    // 【服务器】: 对不同进程的一些处理
    public struct ProcessActorId {
        public int Process;
        public long ActorId;
        public ProcessActorId(long actorId) {
            InstanceIdStruct instanceIdStruct = new InstanceIdStruct(actorId);
            this.Process = instanceIdStruct.Process;
            instanceIdStruct.Process = Options.Instance.Process;
            this.ActorId = instanceIdStruct.ToLong();
        }
    }

    public struct NetInnerComponentOnRead {
        public long ActorId;
        public object Message;
    }

    [ComponentOf(typeof(Scene))]
    public class NetInnerComponent: Entity, IAwake<IPEndPoint>, IAwake, IDestroy {
        public int ServiceId;

        public NetworkProtocol InnerProtocol = NetworkProtocol.KCP;
        [StaticField]
        public static NetInnerComponent Instance;
    }
}
```

1.2 NetInnerComponentSystem: 生成系

```
[FriendOf(typeof(NetInnerComponent))]
public static class NetInnerComponentSystem {
    [ObjectSystem]
    public class NetInnerComponentAwakeSystem: AwakeSystem<NetInnerComponent> {
        protected override void Awake(NetInnerComponent self) {
            NetInnerComponent.Instance = self;
            switch (self.InnerProtocol) {
                case NetworkProtocol.TCP: {
                    self.ServiceId = NetServices.Instance.AddService(new TService(AddressFamily.InterNetwork, ServiceType.I
                    break;
                }
                case NetworkProtocol.KCP: {
                    self.ServiceId = NetServices.Instance.AddService(new KService(AddressFamily.InterNetwork, ServiceType.I
                    break;
```

```
                }
            }
            NetServices.Instance.RegisterReadCallback(self.ServiceId, self.OnRead);
            NetServices.Instance.RegisterErrorCallback(self.ServiceId, self.OnError);
        }
    }
    [ObjectSystem]
    public class NetInnerComponentAwake1System: AwakeSystem<NetInnerComponent, IPEndPoint> {
        protected override void Awake(NetInnerComponent self, IPEndPoint address) {
            NetInnerComponent.Instance = self;
            switch (self.InnerProtocol) {
                case NetworkProtocol.TCP: {
                    self.ServiceId = NetServices.Instance.AddService(new TService(address, ServiceType.Inner));
                    break;
                }
                case NetworkProtocol.KCP: {
                    self.ServiceId = NetServices.Instance.AddService(new KService(address, ServiceType.Inner));
                    break;
                }
            }
            NetServices.Instance.RegisterAcceptCallback(self.ServiceId, self.OnAccept);
            NetServices.Instance.RegisterReadCallback(self.ServiceId, self.OnRead);
            NetServices.Instance.RegisterErrorCallback(self.ServiceId, self.OnError);
        }
    }
    [ObjectSystem]
    public class NetInnerComponentDestroySystem: DestroySystem<NetInnerComponent> {
        protected override void Destroy(NetInnerComponent self) {
            NetServices.Instance.RemoveService(self.ServiceId);
        }
    }
    private static void OnRead(this NetInnerComponent self, long channelId, long actorId, object message) {
        Session session = self.GetChild<Session>(channelId);
        if (session == null)
            return;
        session.LastRecvTime = TimeHelper.ClientFrameTime();
        self.HandleMessage(actorId, message);
    }
    public static void HandleMessage(this NetInnerComponent self, long actorId, object message) {
        EventSystem.Instance.Publish(Root.Instance.Scene, new NetInnerComponentOnRead() { ActorId = actorId, Message = mess
    }
    private static void OnError(this NetInnerComponent self, long channelId, int error) {
        Session session = self.GetChild<Session>(channelId);
        if (session == null)
            return;
        session.Error = error;
        session.Dispose();
    }
    // 这个 channelId 是由 CreateAcceptChannelId 生成的
    private static void OnAccept(this NetInnerComponent self, long channelId, IPEndPoint ipEndPoint) {
        Session session = self.AddChildWithId<Session, int>(channelId, self.ServiceId);
        session.RemoteAddress = ipEndPoint;
        // session.AddComponent<SessionIdleCheckerComponent, int, int, int>(NetThreadComponent.checkInteral, NetThreadCompo
    }
    private static Session CreateInner(this NetInnerComponent self, long channelId, IPEndPoint ipEndPoint) {
        Session session = self.AddChildWithId<Session, int>(channelId, self.ServiceId);
        session.RemoteAddress = ipEndPoint;
        NetServices.Instance.CreateChannel(self.ServiceId, channelId, ipEndPoint);
        // session.AddComponent<InnerPingComponent>();
        // session.AddComponent<SessionIdleCheckerComponent, int, int, int>(NetThreadComponent.checkInteral, NetThreadCompo
        return session;
    }
    // 内网 actor session，channelId 是进程号
    public static Session Get(this NetInnerComponent self, long channelId) {
        Session session = self.GetChild<Session>(channelId);
        if (session != null)
            return session;
        IPEndPoint ipEndPoint = StartProcessConfigCategory.Instance.Get((int) channelId).InnerIPPort;
        session = self.CreateInner(channelId, ipEndPoint);
        return session;
    }
}
```

1.3 NetServerComponent:

```
public struct NetServerComponentOnRead {
    public Session Session;
    public object Message;
}
[ComponentOf(typeof(Scene))]
public class NetServerComponent: Entity, IAwake<IPEndPoint>, IDestroy {
    public int ServiceId;
}
```

1.4 NetServerComponentSystem: 生成系

```
[FriendOf(typeof(NetServerComponent))]
public static class NetServerComponentSystem {
    [ObjectSystem]
    public class AwakeSystem: AwakeSystem<NetServerComponent, IPEndPoint> {
        protected override void Awake(NetServerComponent self, IPEndPoint address) {
            self.ServiceId = NetServices.Instance.AddService(new KService(address, ServiceType.Outer));
            NetServices.Instance.RegisterAcceptCallback(self.ServiceId, self.OnAccept);
            NetServices.Instance.RegisterReadCallback(self.ServiceId, self.OnRead);
            NetServices.Instance.RegisterErrorCallback(self.ServiceId, self.OnError);
        }
    }
    [ObjectSystem]
    public class NetKcpComponentDestroySystem: DestroySystem<NetServerComponent> {
        protected override void Destroy(NetServerComponent self) {
            NetServices.Instance.RemoveService(self.ServiceId);
        }
    }
    private static void OnError(this NetServerComponent self, long channelId, int error) {
        Session session = self.GetChild<Session>(channelId);
        if (session == null)
            return;
        session.Error = error;
        session.Dispose();
    }
    // 这个 channelId 是由 CreateAcceptChannelId 生成的
    private static void OnAccept(this NetServerComponent self, long channelId, IPEndPoint ipEndPoint) {
        Session session = self.AddChildWithId<Session, int>(channelId, self.ServiceId);
        session.RemoteAddress = ipEndPoint;
        if (self.DomainScene().SceneType != SceneType.BenchmarkServer) {
            // 挂上这个组件，5 秒就会删除 session，所以客户端验证完成要删除这个组件。该组件的作用就是防止外挂一直连接不发消息也不进
            session.AddComponent<SessionAcceptTimeoutComponent>();
            // 客户端连接，2 秒检查一次 recv 消息，10 秒没有消息则断开
            session.AddComponent<SessionIdleCheckerComponent>();
        }
    }
    private static void OnRead(this NetServerComponent self, long channelId, long actorId, object message) {
        Session session = self.GetChild<Session>(channelId);
        if (session == null)
            return;
        session.LastRecvTime = TimeHelper.ClientNow();
        OpcodeHelper.LogMsg(self.DomainZone(), message);
        EventSystem.Instance.Publish(Root.Instance.Scene, new NetServerComponentOnRead() {Session = session, Message = mess
    }
}
```

2 IAwake 接口类系统，IStart 重构丢了

- 感觉还比较直接，就是帮助搭建热更新域与 Unity 常规工程域生命周期回调的桥，搭桥连线，连能就可以了。应该可以扩散出个 IStart 接口类

2.1 IMessage,IRequest,IResponse: 进程内？消息类

```
public interface IMessage {}
public interface IRequest: IMessage {
    int RpcId { get; set; }
}
```

```
public interface IResponse: IMessage {
    int Error { get; set; }
    string Message { get; set; }
    int RpcId { get; set; }
}
```

2.2 IActorMessage,IActorRequest,IActorResponse: 进程间的？消息类

```
// 不需要返回消息
public interface IActorMessage: IMessage {}
public interface IActorRequest: IRequest {}
public interface IActorResponse: IResponse {}
```

2.3 IActorLocationMessage: 进程间的位置消息相关

```
public interface IActorLocationMessage: IActorRequest {}
public interface IActorLocationRequest: IActorRequest {}
public interface IActorLocationResponse: IActorResponse {}
```

2.4 IMHandler,IMActorHandler: 消息处理器口类【傻傻分不清楚】

```
public interface IMHandler { // 同进程内的
    void Handle(Session session, object message);
    Type GetMessageType();
    Type GetResponseType();
}
public interface IMActorHandler { // 进程间的？
    // ETTask Handle(Entity entity, int fromProcess, object actorMessage);
    void Handle(Entity entity, int fromProcess, object actorMessage); // 自己改成这样的
    Type GetRequestType();
    Type GetResponseType();
}
```

2.5 ILoad,ISystemType: 加载系

```
public interface ISystemType {
    Type Type();
    Type SystemType();
    InstanceQueueIndex GetInstanceQueueIndex();
}

public interface ILoad {
}
public interface ILoadSystem: ISystemType {
    void Run(Entity o);
}
[ObjectSystem]
public abstract class LoadSystem<T> : ILoadSystem where T: Entity, ILoad {
    void ILoadSystem.Run(Entity o) {
        this.Load((T)o);
    }
    Type ISystemType.Type() {
        return typeof(T);
    }
    Type ISystemType.SystemType() {
        return typeof(ILoadSystem);
    }
    InstanceQueueIndex ISystemType.GetInstanceQueueIndex() {
        return InstanceQueueIndex.Load;
    }
    protected abstract void Load(T self);
}
```

2.6 IAwake: 最多可以带四个参数

```
public interface IAwake {}
public interface IAwake<A> {}
public interface IAwake<A, B> {}
```

```
public interface IAwake<A, B, C> {}
public interface IAwake<A, B, C, D> {}
```

2.7 IStartSystem,StartSystem<T>: 自己加的。【还有问题】系统找不到

```
public interface IStart { }
public interface IStartSystem : ISystemType {
    void Run(Entity o);
}
[ObjectSystem]
public abstract class StartSystem<T> : IStartSystem where T: Entity, IStart {
    public void IStartSystem.Run(Entity o) {
        this.Start((T)o);
    }
    public Type ISystemType.Type() {
        return typeof(T);
    }
    public Type ISystemType.SystemType() {
        return typeof(IStartSystem);
    }
    InstanceQueueIndex ISystemType.GetInstanceQueueIndex() { // 这里没看懂在干什么，大概还有个地方，我得去改
        return InstanceQueueIndex.Start;
    }
    public abstract void Start(T self);
}
// 整合进了系统: InstanceQueueIndex
public enum InstanceQueueIndex {
    None = -1,
    Start, // 需要把这个回调加入框架统筹管理里去
    Update,
    LateUpdate,
    Load,
    Max,
}
```

- 参考项目：除了原文件放在 ET 域。也【复制了一份到客户端的热更新域里】。可是感觉不应该。因为其它所有的回调都不用复制就可以用。我哪里可能还是没能设置对
- 改天再检查一下。但是否，对于非系统框架扩展接口，不得不这样？仍然感觉不应该，因为系统框架里其它的生命周期回调函数都不需要复制。改天再做。

2.8 IUpdateSystem:

```
public interface IUpdate {
}
public interface IUpdateSystem: ISystemType {
    void Run(Entity o);
}
[ObjectSystem]
public abstract class UpdateSystem<T> : IUpdateSystem where T: Entity, IUpdate {
    void IUpdateSystem.Run(Entity o) {
        this.Update((T)o);
    }
    Type ISystemType.Type() {
        return typeof(T);
    }
    Type ISystemType.SystemType() {
        return typeof(IUpdateSystem);
    }
    InstanceQueueIndex ISystemType.GetInstanceQueueIndex() {
        return InstanceQueueIndex.Update;
    }
    protected abstract void Update(T self);
}
```

2.9 ILateUpdate: 好像是用于物理引擎，或是相机什么的更新，生命周期回调

```
public interface ILateUpdate {
}
```

```
public interface ILateUpdateSystem: ISystemType {
    void Run(Entity o);
}
[ObjectSystem]
public abstract class LateUpdateSystem<T> : ILateUpdateSystem where T: Entity, ILateUpdate {
    void ILateUpdateSystem.Run(Entity o) {
        this.LateUpdate((T)o);
    }
    Type ISystemType.Type() {
        return typeof(T);
    }
    Type ISystemType.SystemType() {
        return typeof(ILateUpdateSystem);
    }
    InstanceQueueIndex ISystemType.GetInstanceQueueIndex() {
        return InstanceQueueIndex.LateUpdate;
    }
    protected abstract void LateUpdate(T self);
}
```

2.10 ISingletonAwake|Update|LateUpdate: Singleton 生命周期回调

```
public interface ISingletonAwake {
    void Awake();
}
public interface ISingletonUpdate {
    void Update();
}
public interface ISingletonLateUpdate {
    void LateUpdate();
}
```

2.11 ISingleton,Singleton<T>: 单例

```
public interface ISingleton: IDisposable {
    void Register();
    void Destroy();
    bool IsDisposed();
}
public abstract class Singleton<T>: ISingleton where T: Singleton<T>, new() {
    private bool isDisposed;
    [StaticField]
    private static T instance;
    public static T Instance {
        get {
            return instance;
        }
    }
    void ISingleton.Register() {
        if (instance != null) {
            throw new Exception($"singleton register twice! {typeof (T).Name}");
        }
        instance = (T)this;
    }
    void ISingleton.Destroy() {
        if (this.isDisposed) {
            return;
        }
        this.isDisposed = true;

        instance.Dispose();
        instance = null;
    }
    bool ISingleton.IsDisposed() {
        return this.isDisposed;
    }
    public virtual void Dispose() {
    }
}
```

2.12 IDestroy,IDestroySystem,DestroySystem<T>: 销毁系

```
public interface IDestroy {
}
public interface IDestroySystem: ISystemType {
    void Run(Entity o);
}
[ObjectSystem]
public abstract class DestroySystem<T> : IDestroySystem where T: Entity, IDestroy {
    void IDestroySystem.Run(Entity o) {
        this.Destroy((T)o);
    }
    Type ISystemType.SystemType() {
        return typeof(IDestroySystem);
    }
    InstanceQueueIndex ISystemType.GetInstanceQueueIndex() {
        return InstanceQueueIndex.None;
    }
    Type ISystemType.Type() {
        return typeof(T);
    }
    protected abstract void Destroy(T self);
}
```

2.13 IEvent,AEvent<A>: 事件

```
public interface IEvent {
    Type Type { get; }
}
public abstract class AEvent<A>: IEvent where A: struct {
    public Type Type {
        get {
            return typeof (A);
        }
    }
    protected abstract ETTask Run(Scene scene, A a);
    public async ETTask Handle(Scene scene, A a) {
        try {
            await Run(scene, a);
        }
        catch (Exception e) {
            Log.Error(e);
        }
    }
}
```

2.14 IAddComponent: 添加组件系

```
 public interface IAddComponent { }
 public interface IAddComponentSystem: ISystemType {
     void Run(Entity o, Entity component);
 }
 [ObjectSystem]
 public abstract class AddComponentSystem<T> : IAddComponentSystem where T: Entity, IAddComponent {
     void IAddComponentSystem.Run(Entity o, Entity component) {
         this.AddComponent((T)o, component);
     }
     Type ISystemType.SystemType() {
         return typeof(IAddComponentSystem);
     }
     InstanceQueueIndex ISystemType.GetInstanceQueueIndex() {
         return InstanceQueueIndex.None;
     }
     Type ISystemType.Type() {
         return typeof(T);
     }
     protected abstract void AddComponent(T self, Entity component);
 }
```

2.15 IGetComponent: 获取组件系。【这里没有看明白】：再去找细节 // «««««««««««

```
// GetComponentSystem 有巨大作用，比如每次保存 Unit 的数据不需要所有组件都保存，只需要保存 Unit 变化过的组件
// 是否变化可以通过判断该组件是否 GetComponent，Get 了就记录该组件【这里没有看明白】：再去找细节  // <<<<<<<<<<<<<<<<<<<
// 这样可以只保存 Unit 变化过的组件
// 再比如传送也可以做此类优化
public interface IGetComponent {
}
public interface IGetComponentSystem: ISystemType {
    void Run(Entity o, Entity component);
}
[ObjectSystem]
public abstract class GetComponentSystem<T> : IGetComponentSystem where T: Entity, IGetComponent {
    void IGetComponentSystem.Run(Entity o, Entity component) {
        this.GetComponent((T)o, component);
    }
    Type ISystemType.SystemType() {
        return typeof(IGetComponentSystem);
    }
    InstanceQueueIndex ISystemType.GetInstanceQueueIndex() {
        return InstanceQueueIndex.None;
    }
    Type ISystemType.Type() {
        return typeof(T);
    }
    protected abstract void GetComponent(T self, Entity component);
}
```

2.16 ISerializeToEntity,IDeserialize,IDeserializeSystem,DeserializeSystem<T 序列化，反序列化

```
public interface ISerializeToEntity {
}
public interface IDeserialize {
}
public interface IDeserializeSystem: ISystemType {
    void Run(Entity o);
}
// 反序列化后执行的 System
[ObjectSystem]
public abstract class DeserializeSystem<T> : IDeserializeSystem where T: Entity, IDeserialize {
    void IDeserializeSystem.Run(Entity o) {
        this.Deserialize((T)o);
    }
    Type ISystemType.SystemType() {
        return typeof(IDeserializeSystem);
    }
    InstanceQueueIndex ISystemType.GetInstanceQueueIndex() {
        return InstanceQueueIndex.None;
    }
    Type ISystemType.Type() {
        return typeof(T);
    }
    protected abstract void Deserialize(T self);
}
```

2.17 IInvoke,AInvokeHandler<A>,AInvokeHandler<A, T>: 激活类

```
public interface IInvoke {
    Type Type { get; }
}
public abstract class AInvokeHandler<A>: IInvoke where A: struct {
    public Type Type {
        get {
            return typeof (A);
        }
    }
    public abstract void Handle(A a);
}
public abstract class AInvokeHandler<A, T>: IInvoke where A: struct {
```

```
    public Type Type {
        get {
            return typeof (A);
        }
    }
    public abstract T Handle(A a);
}
```

2.18 ProtoBuf 相关:IExtensible,IExtension,IProtoOutput<TOutput>,IMeasur 看不懂

2.18.1 IExtensible

```
// Indicates that the implementing type has support for protocol-buffer
// <see cref="IExtension">extensions</see>.
// <remarks>Can be implemented by deriving from Extensible.</remarks>
public interface IExtensible {
    // Retrieves the <see cref="IExtension">extension</see> object for the current
    // instance, optionally creating it if it does not already exist.
    // <param name="createIfMissing">Should a new extension object be
    // created if it does not already exist?</param>
    // <returns>The extension object if it exists (or was created), or null
    // if the extension object does not exist or is not available.</returns>
    // <remarks>The <c>createIfMissing</c> argument is false during serialization,
    // and true during deserialization upon encountering unexpected fields.</remarks>
    IExtension GetExtensionObject(bool createIfMissing);
}
```

2.18.2 IExtension

```
// Provides addition capability for supporting unexpected fields during
// protocol-buffer serialization/deserialization. This allows for loss-less
// round-trip/merge, even when the data is not fully understood.
public interface IExtension {
    // Requests a stream into which any unexpected fields can be persisted.
    // <returns>A new stream suitable for storing data.</returns>
    Stream BeginAppend();
    // Indicates that all unexpected fields have now been stored. The
    // implementing class is responsible for closing the stream. If
    // "commit" is not true the data may be discarded.
    // <param name="stream">The stream originally obtained by BeginAppend.</param>
    // <param name="commit">True if the append operation completed successfully.</param>
    void EndAppend(Stream stream, bool commit);
    // Requests a stream of the unexpected fields previously stored.
    // <returns>A prepared stream of the unexpected fields.</returns>
    Stream BeginQuery();
    // Indicates that all unexpected fields have now been read. The
    // implementing class is responsible for closing the stream.
    // <param name="stream">The stream originally obtained by BeginQuery.</param>
    void EndQuery(Stream stream);
    // Requests the length of the raw binary stream; this is used
    // when serializing sub-entities to indicate the expected size.
    // <returns>The length of the binary stream representing unexpected data.</returns>
    int GetLength();
}
// Provides the ability to remove all existing extension data
public interface IExtensionResettable : IExtension {
    void Reset();
}
```

2.18.3 IProtoOutput<TOutput>,IMeasuredProtoOutput<TOutput>,MeasureState<T>: 看得头大

```
// Represents the ability to serialize values to an output of type <typeparamref name="TOutput"/>
public interface IProtoOutput<TOutput> {
    // Serialize the provided value
    void Serialize<T>(TOutput destination, T value, object userState = null);
}
// Represents the ability to serialize values to an output of type <typeparamref name="TOutput"/>
// with pre-computation of the length
```

```
public interface IMeasuredProtoOutput<TOutput> : IProtoOutput<TOutput> {
    // Measure the length of a value in advance of serialization
    MeasureState<T> Measure<T>(T value, object userState = null);
    // Serialize the previously measured value
    void Serialize<T>(MeasureState<T> measured, TOutput destination);
}
// Represents the outcome of computing the length of an object; since this may have required computing lengths
// for multiple objects, some metadata is retained so that a subsequent serialize operation using
// this instance can re-use the previously calculated lengths. If the object state changes between the
// measure and serialize operations, the behavior is undefined.
public struct MeasureState<T> : IDisposable {
// note: * does not actually implement this API;
// it only advertises it for 3.* capability/feature-testing, i.e.
// callers can check whether a model implements
// IMeasuredProtoOutput<Foo>, and *work from that*
    public void Dispose() => throw new NotImplementedException();
    public long Length => throw new NotImplementedException();
}
```

3 ActorMessage 相关:【早上】看下

3.1 MailBoxComponent: 挂上这个组件表示该 Entity 是一个 Actor, 接收的消息将会队列处理

```
// 挂上这个组件表示该 Entity 是一个 Actor, 接收的消息将会队列处理
[ComponentOf]
public class MailBoxComponent: Entity, IAwake, IAwake<MailboxType> {
    // Mailbox 的类型
    public MailboxType MailboxType { get; set; }
}
```

3.2 MailboxType

```
public enum MailboxType {
    MessageDispatcher, // 消息分发器
    UnOrderMessageDispatcher,// 无序分发
    GateSession,// 网关？
}
```

3.3 ActorMessageSenderComponent: 管理类组件

```
[ComponentOf(typeof(Scene))]
public class ActorMessageSenderComponent: Entity, IAwake, IDestroy {
    public const long TIMEOUT_TIME = 40 * 1000;
    public static ActorMessageSenderComponent Instance { get; set; }
    public int RpcId;
    public readonly SortedDictionary<int, ActorMessageSender> requestCallback = new SortedDictionary<int, ActorMessageSende
    public long TimeoutCheckTimer;
    public List<int> TimeoutActorMessageSenders = new List<int>();
}
```

3.4 ActorMessageSenderComponentSystem: 多带个 Timer

- 这个类我好像认真读过，大概是小伙伴搬家超时，什么之类的，改天再读一遍

```
[FriendOf(typeof(ActorMessageSenderComponent))]
public static class ActorMessageSenderComponentSystem {
    [Invoke(TimerInvokeType.ActorMessageSenderChecker)] // 另一个新标签，激活系
    public class ActorMessageSenderChecker: ATimer<ActorMessageSenderComponent> {
        protected override void Run(ActorMessageSenderComponent self) {
            try {
                self.Check();
            }
            catch (Exception e) {
                Log.Error($"move timer error: {self.Id}\n{e}");
            }
        }
```

```
}
[ObjectSystem]
public class ActorMessageSenderComponentAwakeSystem: AwakeSystem<ActorMessageSenderComponent> {
    protected override void Awake(ActorMessageSenderComponent self) { // ...
    }
}
[ObjectSystem]
public class ActorMessageSenderComponentDestroySystem: DestroySystem<ActorMessageSenderComponent> {
    protected override void Destroy(ActorMessageSenderComponent self) { // ...
    }
}
private static void Run(ActorMessageSender self, IActorResponse response) {
    if (response.Error == ErrorCore.ERR_ActorTimeout) {
        self.Tcs.SetException(new Exception($"Rpc error: request, 注意 Actor 消息超时, 请注意查看是否死锁或者没有 re
        return;
    }
    if (self.NeedException && ErrorCore.IsRpcNeedThrowException(response.Error)) {
        self.Tcs.SetException(new Exception($"Rpc error: actorId: {self.ActorId} request: {self.Request}, respons
        return;
    }
    self.Tcs.SetResult(response);
}
private static void Check(this ActorMessageSenderComponent self) {
    long timeNow = TimeHelper.ServerNow();
    foreach ((int key, ActorMessageSender value) in self.requestCallback) {
        // 因为是顺序发送的, 所以, 检测到第一个不超时的就退出
        if (timeNow < value.CreateTime + ActorMessageSenderComponent.TIMEOUT_TIME)
            break;
        self.TimeoutActorMessageSenders.Add(key);
    }
    foreach (int rpcId in self.TimeoutActorMessageSenders) {
        ActorMessageSender actorMessageSender = self.requestCallback[rpcId];
        self.requestCallback.Remove(rpcId);
        try {
            IActorResponse response = ActorHelper.CreateResponse(actorMessageSender.Request, ErrorCore.ERR_ActorT
            Run(actorMessageSender, response);
        }
        catch (Exception e) {
            Log.Error(e.ToString());
        }
    }
    self.TimeoutActorMessageSenders.Clear();
}
public static void Send(this ActorMessageSenderComponent self, long actorId, IMessage message) {
    if (actorId == 0)
        throw new Exception($"actor id is 0: {message}");
    ProcessActorId processActorId = new(actorId);
    // 这里做了优化, 如果发向同一个进程, 则直接处理, 不需要通过网络层
    if (processActorId.Process == Options.Instance.Process) {
        NetInnerComponent.Instance.HandleMessage(actorId, message);
        return;
    }
    Session session = NetInnerComponent.Instance.Get(processActorId.Process);
    session.Send(processActorId.ActorId, message);
}
public static int GetRpcId(this ActorMessageSenderComponent self) {
    return ++self.RpcId;
}
public static async ETTask<IActorResponse> Call(
    this ActorMessageSenderComponent self,
    long actorId,
    IActorRequest request,
    bool needException = true
    ) {
    request.RpcId = self.GetRpcId();
    if (actorId == 0)
        throw new Exception($"actor id is 0: {request}");
    return await self.Call(actorId, request.RpcId, request, needException);
}
public static async ETTask<IActorResponse> Call(
    this ActorMessageSenderComponent self,
    long actorId,
    int rpcId,
    IActorRequest iActorRequest,
    bool needException = true
```

```
            ) {
            if (actorId == 0)
                throw new Exception($"actor id is 0: {iActorRequest}");
            var tcs = ETTask<IActorResponse>.Create(true);
            self.requestCallback.Add(rpcId, new ActorMessageSender(actorId, iActorRequest, tcs, needException));
            self.Send(actorId, iActorRequest);
            long beginTime = TimeHelper.ServerFrameTime();
            IActorResponse response = await tcs;
            long endTime = TimeHelper.ServerFrameTime();
            long costTime = endTime - beginTime;
            if (costTime > 200)
                Log.Warning($"actor rpc time > 200: {costTime} {iActorRequest}");
            return response;
        }
        public static void HandleIActorResponse(this ActorMessageSenderComponent self, IActorResponse response) {
            ActorMessageSender actorMessageSender;
            if (!self.requestCallback.TryGetValue(response.RpcId, out actorMessageSender))
                return;
            self.requestCallback.Remove(response.RpcId);
            Run(actorMessageSender, response);
        }
    }
```

3.5 ActorHandleHelper 帮助类

```
public static class ActorHandleHelper {
    public static void Reply(int fromProcess, IActorResponse response) {
        if (fromProcess == Options.Instance.Process) { // 返回消息是同一个进程
            // NetInnerComponent.Instance.HandleMessage(realActorId, response); // 等同于直接调用下面这句【我自己暂时放回来的】
            ActorMessageSenderComponent.Instance.HandleIActorResponse(response);
            return;
        }
        Session replySession = NetInnerComponent.Instance.Get(fromProcess);
        replySession.Send(response);
    }
    public static void HandleIActorResponse(IActorResponse response) {
        ActorMessageSenderComponent.Instance.HandleIActorResponse(response);
    }
    // 分发 actor 消息
    [EnableAccessEntiyChild]
    public static async ETTask HandleIActorRequest(long actorId, IActorRequest iActorRequest) {
        InstanceIdStruct instanceIdStruct = new(actorId);
        int fromProcess = instanceIdStruct.Process;
        instanceIdStruct.Process = Options.Instance.Process;
        long realActorId = instanceIdStruct.ToLong();
        Entity entity = Root.Instance.Get(realActorId);
        if (entity == null) {
            IActorResponse response = ActorHelper.CreateResponse(iActorRequest, ErrorCore.ERR_NotFoundActor);
            Reply(fromProcess, response);
            return;
        }
        MailBoxComponent mailBoxComponent = entity.GetComponent<MailBoxComponent>();
        if (mailBoxComponent == null) {
            Log.Warning($"actor not found mailbox: {entity.GetType().Name} {realActorId} {iActorRequest}");
            IActorResponse response = ActorHelper.CreateResponse(iActorRequest, ErrorCore.ERR_NotFoundActor);
            Reply(fromProcess, response);
            return;
        }
        switch (mailBoxComponent.MailboxType) {
            case MailboxType.MessageDispatcher: {
                using (await CoroutineLockComponent.Instance.Wait(CoroutineLockType.Mailbox, realActorId)) {
                    if (entity.InstanceId != realActorId) {
                        IActorResponse response = ActorHelper.CreateResponse(iActorRequest, ErrorCore.ERR_NotFoundActor);
                        Reply(fromProcess, response);
                        break;
                    }
                    await ActorMessageDispatcherComponent.Instance.Handle(entity, fromProcess, iActorRequest);
                }
                break;
            }
            case MailboxType.UnOrderMessageDispatcher: {
                await ActorMessageDispatcherComponent.Instance.Handle(entity, fromProcess, iActorRequest);
                break;
            }
```

```
            case MailboxType.GateSession:
            default:
                throw new Exception($"no mailboxtype: {mailBoxComponent.MailboxType} {iActorRequest}");
        }
    }
    // 分发 actor 消息
    [EnableAccessEntiyChild]
    public static async ETTask HandleIActorMessage(long actorId, IActorMessage iActorMessage) {
        InstanceIdStruct instanceIdStruct = new(actorId);
        int fromProcess = instanceIdStruct.Process;
        instanceIdStruct.Process = Options.Instance.Process;
        long realActorId = instanceIdStruct.ToLong();
        Entity entity = Root.Instance.Get(realActorId);
        if (entity == null) {
            Log.Error($"not found actor: {realActorId} {iActorMessage}");
            return;
        }
        MailBoxComponent mailBoxComponent = entity.GetComponent<MailBoxComponent>();
        if (mailBoxComponent == null) {
            Log.Error($"actor not found mailbox: {entity.GetType().Name} {realActorId} {iActorMessage}");
            return;
        }
        switch (mailBoxComponent.MailboxType) {
        case MailboxType.MessageDispatcher: {
            using (await CoroutineLockComponent.Instance.Wait(CoroutineLockType.Mailbox, realActorId)) {
                if (entity.InstanceId != realActorId) {
                    break;
                }
                await ActorMessageDispatcherComponent.Instance.Handle(entity, fromProcess, iActorMessage);
            }
            break;
        }
        case MailboxType.UnOrderMessageDispatcher: {
            await ActorMessageDispatcherComponent.Instance.Handle(entity, fromProcess, iActorMessage);
            break;
        }
        case MailboxType.GateSession: {
            if (entity is Session gateSession) {
                // 发送给客户端
                gateSession.Send(iActorMessage);
            }
            break;
        }
        default:
            throw new Exception($"no mailboxtype: {mailBoxComponent.MailboxType} {iActorMessage}");
        }
    }
}
```

4 【拖拉机游戏房间】组件: 分析

4.1 TractorRoomEvent: 拖拉机房间, 【待修改完成】

```
// UI 系统的事件机制: 定义, 如何创建拖拉机游戏房间【TODO:】UNITY 里是需要制作相应预设的
[UIEvent(UIType.TractorRoom)]
public class TractorRoomEvent: AUIEvent {
    public override async ETTask<UI> OnCreate(UIComponent uiComponent, UILayer uiLayer) {
        await ETTask.CompletedTask;
        await uiComponent.DomainScene().GetComponent<ResourcesLoaderComponent>().LoadAsync(UIType.TractorRoom.StringToAB())

        GameObject bundleGameObject = (GameObject) ResourcesComponent.Instance.GetAsset(UIType.TractorRoom.StringToAB(), UI
        GameObject room = UnityEngine.Object.Instantiate(bundleGameObject, UIEventComponent.Instance.GetLayer((int)uiLayer)
        UI ui = uiComponent.AddChild<UI, string, GameObject>(UIType.TractorRoom, room);
        //  【拖拉机游戏房间】: 它可能由好几个不同的组件组成, 这里要添加的不止一个
        ui.AddComponent<GamerComponent>(); // 玩家组件: 这个控件带个 UI 小面板, 要怎么添加呢？
        ui.AddComponent<TractorRoomComponent>(); // <<<<<<<<<<<<<<<<<< 房间组件: 合成组件系统, 自带【互动组件】
        return ui;
    }
    public override void OnRemove(UIComponent uiComponent) {
        ResourcesComponent.Instance.UnloadBundle(UIType.TractorRoom.StringToAB());
    }
}
```

4.2 GamerComponent: 玩家【管理类组件】，是对房间里四个玩家的管理。

- 【GamerComponent】玩家组件：是对一个房间里四个玩家的（及其在房间里的坐位位置）管理（分东南西北）。可以添加移除玩家。

```
// 组件：是提供给房间用，用来管理游戏中每个房间里的最多三个当前玩家
public class GamerComponent : Entity, IAwake { // 它也有【生成系】
    private readonly Dictionary<long, int> seats = new Dictionary<long, int>();
    private readonly Gamer[] gamers = new Gamer[4];
    public Gamer LocalGamer { get; set; } // 提供给房间组件用的：就是当前玩家。。。
    // 添加玩家
    public void Add(Gamer gamer, int seatIndex) {
        gamers[seatIndex] = gamer;
        seats[gamer.UserID] = seatIndex;
    }
    // 获取玩家
    public Gamer Get(long id) {
        int seatIndex = GetGamerSeat(id);
        if (seatIndex >= 0)
            return gamers[seatIndex];
        return null;
    }
    // 获取所有玩家
    public Gamer[] GetAll() {
        return gamers;
    }
    // 获取玩家座位索引
    public int GetGamerSeat(long id) {
        int seatIndex;
        if (seats.TryGetValue(id, out seatIndex))
            return seatIndex;
        return -1;
    }
    // 移除玩家并返回
    public Gamer Remove(long id) {
        int seatIndex = GetGamerSeat(id);
        if (seatIndex >= 0) {
            Gamer gamer = gamers[seatIndex];
            gamers[seatIndex] = null;
            seats.Remove(id);
            return gamer;
        }
        return null;
    }
    public override void Dispose() {
        if (this.IsDisposed)
            return;
        base.Dispose();
        this.LocalGamer = null;
        this.seats.Clear();
        for (int i = 0; i < this.gamers.Length; i++)
            if (gamers[i] != null) {
                gamers[i].Dispose();
                gamers[i] = null;
            }
    }
}
```

4.3 Gamer: 【服务端】一个玩家个例。对应这个玩家的相关信息

```
// 房间玩家对象
public sealed class Gamer : Entity, IAwake<long> {
    // 用户 ID（唯一）
    public long UserID { get; private set; }
    // 玩家 GateActorID
    public long PlayerID { get; set; }
    // 玩家所在房间 ID
    public long RoomID { get; set; }
    // 是否准备
    public bool IsReady { get; set; }
    // 是否离线
    public bool isOffline { get; set; }
    public void Awake(long id) {
```

```
        this.UserID = id;
    }
    public override void Dispose() {
        if (this.IsDisposed) return;
        base.Dispose();
        this.UserID = 0;
        this.PlayerID = 0;
        this.RoomID = 0;
        this.IsReady = false;
        this.isOffline = false;
    }
}
```

4.4 Gamer: 【客户端】一个玩家个例。它说只要一点儿信息就行

- 传进程间消息的时候，也只传这两个关键参数。

```
public sealed class Gamer : Entity { // 玩家对象
    // 玩家唯一 ID
    public long UserID { get; set; }
    // 是否准备
    public bool IsReady { get; set; }
    public override void Dispose() {
        if (this.IsDisposed) return;
        base.Dispose();
        this.UserID = 0;
        this.IsReady = false;
    }
}
```

4.5 GamerUIComponent: 【客户端】玩家 UI 组件：每个玩家背个小面板，来显示必要信息（钱，抢不抢庄，反过的主等）

```
public class GamerUIComponent : Entity, IStart { // 玩家 UI 组件
    public GameObject Panel { get; private set; } // UI 面板
    // 玩家昵称
    public string NickName { get { return name.text; } }
    private Image headPhoto;
    private Text prompt;
    private Text name;
    private Text money;
    public void Start() {
        if (this.GetParent<Gamer>().IsReady)
            SetReady();
    }
    // 重置面板
    public void ResetPanel() {
        ResetPrompt();
        this.headPhoto.gameObject.SetActive(false);
        this.name.text = " 空位";
        this.money.text = "";
        this.Panel = null;
        this.prompt = null;
        this.name = null;
        this.money = null;
        this.headPhoto = null;
    }
    // 设置面板
    public void SetPanel(GameObject panel) {
        this.Panel = panel;
        // 绑定关联
        this.prompt = this.Panel.Get<GameObject>("Prompt").GetComponent<Text>();
        this.name = this.Panel.Get<GameObject>("Name").GetComponent<Text>();
        this.money = this.Panel.Get<GameObject>("Money").GetComponent<Text>();
        this.headPhoto = this.Panel.Get<GameObject>("HeadPhoto").GetComponent<Image>();
        UpdatePanel();
    }
    // 更新面板
    public void UpdatePanel() {
        if (this.Panel != null) {
            SetUserInfo();
```

```
            headPhoto.gameObject.SetActive(false);
        }
    }
    // 设置玩家身份
    public void SetIdentity(Identity identity) {
        if (identity == Identity.None) return;
        string spriteName = $"Identity_{Enum.GetName(typeof(Identity), identity)}";
        Sprite headSprite = CardHelper.GetCardSprite(spriteName);
        headPhoto.sprite = headSprite;
        headPhoto.gameObject.SetActive(true);
    }
    // 玩家准备
    public void SetReady() {
        prompt.text = " 准备! ";
    }
    // 出牌错误
    public void SetPlayCardsError() {
        prompt.text = " 您出的牌不符合规则! ";
    }
    // 玩家不出
    public void SetDiscard() {
        prompt.text = " 不出";
    }
    // 打 2 时，玩家抢不抢庄：或者去想，玩家要不要反主牌花色
    public void SetGrab(GrabLandlordState state) {
        switch (state) {
        case GrabLandlordState.Not:
            break;
        case GrabLandlordState.Grab:
            prompt.text = " 抢地主";
            break;
        case GrabLandlordState.UnGrab:
            prompt.text = " 不抢";
            break;
        }
    }
    public void ResetPrompt() { // 重置提示
        prompt.text = "";
    }
    public void GameStart() { // 游戏开始
        ResetPrompt();
    }
    private async void SetUserInfo() { // 设置用户信息
        G2C_GetUserInfo_Ack g2C_GetUserInfo_Ack = await SessionComponent.Instance.Session.Call(new C2G_GetUserInfo_Req() {
        if (this.Panel != null) {
            name.text = g2C_GetUserInfo_Ack.NickName;
            money.text = g2C_GetUserInfo_Ack.Money.ToString();
        }
    }
    public override void Dispose() {
        if (this.IsDisposed) return;
        base.Dispose();
        ResetPanel(); // 重置玩家 UI
    }
}
```

4.6 Protobuf 里面的消息与参考

- 这里把 Protobuf 里面可以传的游戏相关也整理一下。

```
message GamerInfo {
    int64 UserID = 1;
    bool IsReady = 2;
}
message GamerScore {
    int64 UserID = 1;
    int64 Score = 2;
}
message GamerState {
    int64 UserID = 1;
    ET.Server.Identity UserIdentity = 2; // 命名空间的问题
^^IGrabLandlordState State = 3;
}
```

```
message GamerCardNum { // IMessage
    int64 UserID = 1;
    int32 Num = 2;
}
message Actor_GamerGrabLandlordSelect_Ntt { // IActorMessage 参考去想：抢庄，与反主牌花色，如何写消息
    int32 RpcId = 90;
    int64 ActorId = 94;
    int64 UserID = 1;
    bool IsGrab = 2;
}
```

4.7 TractorRoomComponent: 游戏房间，自带其它组件，当有嵌套时，如何才能系统化地、工厂化地、UI 上的事件驱动地，生成这个组件呢？

```
public class TractorRoomComponent : Entity, IAwake {
    private TractorInteractionComponent interaction; // 嵌套组件：互动组件
    private Text multiples;
    public readonly GameObject[] GamersPanel = new GameObject[4];
    public bool Matching { get; set; }
    public TractorInteractionComponent Interaction { // 组件里套组件，要如何事件机制触发生成？
        get {
            if (interaction == null) {
                UI uiRoom = this.GetParent<UI>();
                UI uiInteraction = TractorInteractionFactory.Create(UIType.TractorInteraction, uiRoom);
                interaction = uiInteraction.GetComponent<TractorInteractionComponent>();
            }
            return interaction;
        }
    }
```

4.8 TractorInteractionComponent: 感觉是视图 UI 上的一堆调控，逻辑控制

- 上下这一两个组件里，除了 ProtoBuf 消息里传递的类找不到，没有其它错误
- 【嵌套】：是这里的难点。其它都可以一个触发一个地由事件发布触发订阅者的回调，可是当一个组件内存在嵌套，又是系统化【内部组件生成完成后，外部组件才生成完成】生成，我是要把这两个组件合并成一个吗？还是说，我不得不把它折成粒度更小的 UI 上的事件驱动机制，以符合系统框架？要去所源码弄透。

```
// 【互动组件】：一堆的视图控件管理
public class TractorInteractionComponent : Entity, IAwake { // 多个按钮：有些暂时是隐藏的
    private Button playButton;
    private Button promptButton;
    private Button discardButton;
    private Button grabButton;
    private Button disgrabButton;
    private Button changeGameModeButton;
    private List<Card> currentSelectCards = new List<Card>();

    public bool isTrusteeship { get; set; }
    public bool IsFirst { get; set; }
```

5 消息处理器：AMActorHandler<E, Message> 继承类的返回类型，全改成了 void

5.1 AMActorHandler<E, Message>: 基类的抽象方法 Run 的返回类型被固定死了，报了狠多错

- 这样，可以把所有自己继承类的报错去掉。可是因为还没能理解透彻，不知道先前的 ETVoid 是为什么，现在会不会产生什么其它意外的错。作个记号。

```
[EnableClass]
public abstract class AMActorHandler<E, Message>: IMActorHandler where E : Entity where Message : class, IActorMessag
```

```
        // protected abstract ETTask Run(E entity, Message message);  // <<<<<<<<<<<<<<<<<<<
        protected abstract void Run(E entity, Message message);  // 可以改成是自己想要的，返回类型，因为只有自己的继承类在使用

        public async ETTask Handle(Entity entity, int fromProcess, object actorMessage) {
            if (actorMessage is not Message msg) {
                Log.Error($" 消息类型转换错误: {actorMessage.GetType().FullName} to {typeof (Message).Name}");
                return;
            }
            if (entity is not E e) {
                Log.Error($"Actor 类型转换错误: {entity.GetType().Name} to {typeof (E).Name} --{typeof (Message).Name}");
                return;
            }
            await this.Run(e, msg);
        }
        public Type GetRequestType() {
            if (typeof (IActorLocationMessage).IsAssignableFrom(typeof (Message))) {
                Log.Error($"message is IActorLocationMessage but handler is AMActorHandler: {typeof (Message)}");
            }
            return typeof (Message);
        }
        public Type GetResponseType() {
            return null;
        }
    }
```

5.2 IMActorHandler: 接口类的定义，同样要改

```
public interface IMActorHandler {
    // ETTask Handle(Entity entity, int fromProcess, object actorMessage);
    void Handle(Entity entity, int fromProcess, object actorMessage); // 自己改成这样的
    Type GetRequestType();
    Type GetResponseType();
}
```

6 Protobuf 里的 enum: 【Identity】【Suits】【Weight】

6.1 OuterMessage_C_10001.proto 里三四个类的定义

- 感觉更多的是命名空间没能弄对。同一份源码一式三份，分别放在【客户端】【双端】【服务端】下只有【客户端】下可以通过读 Card 类的定义，可以知道能自动识别，并且 Protobuf 里的 enum 生成的.cs 与参考项目不同。不知道是否是 Protobuf 版本问题，还是我没注意到的细节。

```
enum Identity { // 身份
    IdentityNone = 0;
    Farmer = 1;     // 平民
    Landlord = 2;   // 地主
}
enum Suits { // 花色
    Club = 0;    // 梅花
    Diamond = 1; // 方块
    Heart = 2;   // 红心
    Spade = 3;   // 黑桃
    None = 4;
}
enum Weight { // 权重
    Three = 0;      // 3
    Four = 1;       // 4
    Five = 2;       // 5
    Six = 3;        // 6
    Seven = 4;      // 7
    Eight = 5;      // 8
    Nine = 6;       // 9
    Ten = 7;        // 10
    Jack = 8;       // J
    Queen = 9;      // Q
    King = 10;       // K
    One = 11;        // A
```

```
        Two = 12;        // 2
        SJoker = 13;     // 小王
        LJoker = 14;     // 大王
    }
    message Card {
        Weight CardWeight = 1;
        Suits CardSuits = 2;
    }
```

6.2 【参考项目】里：enum 是可以顺利写进 ETModel 申明的命名空间，并且源码可见

```
namespace ETModel {
#region Enums
    public enum Suits {
        Club = 0,
        Diamond = 1,
        Heart = 2,
        Spade = 3,
        None = 4,
    }
    public enum Weight {
        Three = 0,
        Four = 1,
        Five = 2,
        Six = 3,
        Seven = 4,
        Eight = 5,
        Nine = 6,
        Ten = 7,
        Jack = 8,
        Queen = 9,
        King = 10,
        One = 11,
        Two = 12,
        Sjoker = 13,
        Ljoker = 14,
    }
    public enum Identity {
        None = 0,
        Farmer = 1,
        Landlord = 2,
    }
#endregion
#region Messages
```

6.3 ET7 框架里，enum 完全找不到

- 一种网络上没能理解透彻的可能是：我不能把三个 enum 类单独列出来，而是把三个类嵌套在必要的需要使用这些 enum 的 message 的定义里，举例如下：
- 如下，对于 Card 类应该是行得通的。可是问题是，我的 card 本来也没有问题。有问题的是，三个 enum 类找不到。那么也就是，我大概还是需要手动定义这三个类在程序的某些域某些地方。【确认一下】

```
message SearchRequest {
    string query = 1;
    int32 page_number = 2;
    enum Corpus { // enum 成员变量一定义嵌套
        UNIVERSAL = 0;
        WEB = 1;
        IMAGES = 2;
        LOCAL = 3;
        NEWS = 4;
        PRODUCTS = 5;
        VIDEO = 6;
    }
    Corpus corpus = 4; // enum 成员变量一定义赋值
}
```

- 觉得这个，是目前最主要的 compile-error 的来源，但不是自己重构项目的重点，还是去看其它的。看如何重构现项目。这个晚上再弄。

6.4 ETModel_Card_Binding: 奇异点，ILRuntime 热更新里，似乎对 Card 类的两个成员变量作了辅助链接

- 还没有细看，不是狠懂这里的原理。但在解决上面的问题之后，如果这两个变量仍不通，会参考这里

```
unsafe class ETModel_Card_Binding {
    public static void Register(ILRuntime.Runtime.Enviorment.AppDomain app) {
        BindingFlags flag = BindingFlags.Public | BindingFlags.Instance | BindingFlags.Static | BindingFlags.Declared
        MethodBase method;
        Type[] args;
        Type type = typeof(ETModel.Card);
        args = new Type[]{};
        method = type.GetMethod("GetName", flag, null, args, null);
        app.RegisterCLRMethodRedirection(method, GetName_0);
        args = new Type[]{};
        method = type.GetMethod("get_CardWeight", flag, null, args, null);
        app.RegisterCLRMethodRedirection(method, get_CardWeight_1);
        args = new Type[]{};
        method = type.GetMethod("get_CardSuits", flag, null, args, null);
        app.RegisterCLRMethodRedirection(method, get_CardSuits_2);
        args = new Type[]{};
        method = type.GetMethod("get_Parser", flag, null, args, null);
        app.RegisterCLRMethodRedirection(method, get_Parser_3);
    }
```

7 ET7 数据库相关【服务端】

- 这个数据库系统，连个添加使用的范例也没有。。。就两个组件，一个管理类。什么也没留下。。
- 这里不急着整理。现框架 **DB 放在服务端的 Model** 里。它的管理体系成为管理各个不同区服的数据库 DBComponent。
- 因为找不到任何参考使用的例子。我觉得需要搜索一下。在理解了参考项目数据库模块之后，根据搜索，决定是使用原参考项目总服务器代理系，还是这种相对改装了的管理区服系统?

7.1 IDBCollection: 主要是方便写两个不同的数据库（好像是 GeekServer 里两个数据库）。反正方便扩展吧

```
public interface IDBCollection {}
```

7.2 DBComponent: 带生成系。可以查表，查询数据

```
[ChildOf(typeof(DBManagerComponent))] // 用来缓存数据
public class DBComponent: Entity, IAwake<string, string, int>, IDestroy {
    public const int TaskCount = 32;
    public MongoClient mongoClient;
    public IMongoDatabase database;
}
```

7.3 DBManagerComponent: 有上面的 DBComponent 数组。数组长度固定吗？

```
public class DBManagerComponent: Entity, IAwake, IDestroy {
    [StaticField]
    public static DBManagerComponent Instance;
    public DBComponent[] DBComponents = new DBComponent[IdGenerater.MaxZone]; // 没事吃饱了撑得，占一大堆空地
}
```

7.4 DBManagerComponentSystem: 主是要查询某个区服的数据库，从数组里

```
[FriendOf(typeof(DBManagerComponent))]
public static class DBManagerComponentSystem {
    [ObjectSystem]
    public class DBManagerComponentAwakeSystem: AwakeSystem<DBManagerComponent> {
        protected override void Awake(DBManagerComponent self) {
            DBManagerComponent.Instance = self;
        }
    }
    [ObjectSystem]
    public class DBManagerComponentDestroySystem: DestroySystem<DBManagerComponent> {
        protected override void Destroy(DBManagerComponent self) {
            DBManagerComponent.Instance = null;
        }
    }
    public static DBComponent GetZoneDB(this DBManagerComponent self, int zone) {
        DBComponent dbComponent = self.DBComponents[zone];
        if (dbComponent != null)
            return dbComponent;
        StartZoneConfig startZoneConfig = StartZoneConfigCategory.Instance.Get(zone);
        if (startZoneConfig.DBConnection == "")
            throw new Exception($"zone: {zone} not found mongo connect string");
        dbComponent = self.AddChild<DBComponent, string, string, int>(startZoneConfig.DBConnection, startZoneConfig.DBName,
        self.DBComponents[zone] = dbComponent;
        return dbComponent;
    }
}
```

7.5 DBProxyComponent: 【参考项目】里的。有生成系。

```
// 用来与数据库操作代理
public class DBProxyComponent: Component {
    public IPEndPoint dbAddress;
}
```

8 StartConfigComponent: 找【各种服】的起始初始化地址

- 这些组群服务器的起始被全部重构了，重构成配置单例了

8.1 ConfigSingleton<T>: ProtoObject, ISingleton

```
public abstract class ConfigSingleton<T>: ProtoObject, ISingleton where T: ConfigSingleton<T>, new() {
    [StaticField]
    private static T instance;
    public static T Instance {
        get {
            return instance ??= ConfigComponent.Instance.LoadOneConfig(typeof (T)) as T;
        }
    }
    void ISingleton.Register() {
        if (instance != null) {
            throw new Exception($"singleton register twice! {typeof (T).Name}");
        }
        instance = (T)this;
    }
    void ISingleton.Destroy() {
        T t = instance;
        instance = null;
        t.Dispose();
    }
    bool ISingleton.IsDisposed() {
        throw new NotImplementedException();
    }
    public override void AfterEndInit() { }
    public virtual void Dispose() { }
}
```

8.2 StartProcessConfigCategory : ConfigSingleton<StartProcessConfigCateg IMerge: 吃饱了撑得吗？

- 当数据库集群成区服的形式，这里各服务器的配置，成了 ProtoBuf 里进程间可传的消息模式?。。。
- 这里配置是从哪里来的呢？仍然是从各种配置文件里

```
[ProtoContract]
[Config]
public partial class StartProcessConfigCategory : ConfigSingleton<StartProcessConfigCategory>, IMerge {
    [ProtoIgnore]
    [BsonIgnore]
    private Dictionary<int, StartProcessConfig> dict = new Dictionary<int, StartProcessConfig>(); // 管理字典
    [BsonElement]
    [ProtoMember(1)]
    private List<StartProcessConfig> list = new List<StartProcessConfig>();
    public void Merge(object o) {
        StartProcessConfigCategory s = o as StartProcessConfigCategory;
        this.list.AddRange(s.list);
    }
    [ProtoAfterDeserialization]
    public void ProtoEndInit() {
        foreach (StartProcessConfig config in list) {
            config.AfterEndInit();
            this.dict.Add(config.Id, config);
        }
        this.list.Clear();
        this.AfterEndInit();
    }
    public StartProcessConfig Get(int id) {
        this.dict.TryGetValue(id, out StartProcessConfig item);
        if (item == null) {
            throw new Exception($" 配置找不到，配置表名: {nameof (StartProcessConfig)}, 配置 id: {id}");
        }
        return item;
    }
    public bool Contain(int id) {
        return this.dict.ContainsKey(id);
    }
    public Dictionary<int, StartProcessConfig> GetAll() {
        return this.dict;
    }
    public StartProcessConfig GetOne() {
        if (this.dict == null || this.dict.Count <= 0) {
            return null;
        }
        return this.dict.Values.GetEnumerator().Current;
    }
}
[ProtoContract]
public partial class StartProcessConfig: ProtoObject, IConfig {
    [ProtoMember(1)]
    public int Id { get; set; }
    [ProtoMember(2)]
    public int MachineId { get; set; }
    [ProtoMember(3)]
    public int InnerPort { get; set; }
}
```

8.3 SceneFactory 里可以给【匹配服】添加组件

```
public static class SceneFactory {
    public static async ETTask<Scene> CreateServerScene(Entity parent, long id, long instanceId, int zone, string name, Sce
        await ETTask.CompletedTask;
        Scene scene = EntitySceneFactory.CreateScene(id, instanceId, zone, sceneType, name, parent);
        scene.AddComponent<MailBoxComponent, MailboxType>(MailboxType.UnOrderMessageDispatcher);
        switch (scene.SceneType) {
            case SceneType.Router:
                scene.AddComponent<RouterComponent, IPEndPoint, string>(startSceneConfig.OuterIPPort, startSceneConfig.Star
                break;
            case SceneType.RouterManager: // 正式发布请用 CDN 代替 RouterManager
```

```
                // 云服务器在防火墙那里做端口映射
                scene.AddComponent<HttpComponent, string>($"http:// *:{startSceneConfig.OuterPort}/");
                break;
            case SceneType.Realm:
                scene.AddComponent<NetServerComponent, IPEndPoint>(startSceneConfig.InnerIPOutPort);
                break;
            case SceneType.Match: // <<<<<<<<<<<<<<<<<<< 这里是，我可以添加【匹配服】相关功能组件的地方。【参考项目原原码】感觉被
                break;
            case SceneType.Gate:
                scene.AddComponent<NetServerComponent, IPEndPoint>(startSceneConfig.InnerIPOutPort);
                scene.AddComponent<PlayerComponent>();
                scene.AddComponent<GateSessionKeyComponent>();
                break;
            case SceneType.Map:
                scene.AddComponent<UnitComponent>();
                scene.AddComponent<AOIManagerComponent>();
                break;
            case SceneType.Location:
                scene.AddComponent<LocationComponent>();
                break;
//...
        }
        return scene;
    }
}
```

8.4 RouterAddressComponent: 路由器组件

```
[ComponentOf(typeof(Scene))]
public class RouterAddressComponent: Entity, IAwake<string, int> {
    public IPAddress RouterManagerIPAddress { get; set; }
    public string RouterManagerHost;
    public int RouterManagerPort;
    public HttpGetRouterResponse Info;
    public int RouterIndex;
}
```

8.5 RouterAddressComponentSystem: 路由器的生成系

```
[FriendOf(typeof(RouterAddressComponent))]
public static class RouterAddressComponentSystem {
    public class RouterAddressComponentAwakeSystem: AwakeSystem<RouterAddressComponent, string, int> {
        protected override void Awake(RouterAddressComponent self, string address, int port) {
            self.RouterManagerHost = address;
            self.RouterManagerPort = port;
        }
    }
    public static async ETTask Init(this RouterAddressComponent self) {
        self.RouterManagerIPAddress = NetworkHelper.GetHostAddress(self.RouterManagerHost);
        await self.GetAllRouter();
    }
    private static async ETTask GetAllRouter(this RouterAddressComponent self) {
        string url = $"http:// {self.RouterManagerHost}:{self.RouterManagerPort}/get_router?v={RandomGenerator.RandUInt32()
        Log.Debug($"start get router info: {url}");
        string routerInfo = await HttpClientHelper.Get(url);
        Log.Debug($"recv router info: {routerInfo}");
        HttpGetRouterResponse httpGetRouterResponse = JsonHelper.FromJson<HttpGetRouterResponse>(routerInfo);
        self.Info = httpGetRouterResponse;
        Log.Debug($"start get router info finish: {JsonHelper.ToJson(httpGetRouterResponse)}");
        // 打乱顺序
        RandomGenerator.BreakRank(self.Info.Routers);
        self.WaitTenMinGetAllRouter().Coroutine();
    }
    // 等 10 分钟再获取一次
    public static async ETTask WaitTenMinGetAllRouter(this RouterAddressComponent self) {
        await TimerComponent.Instance.WaitAsync(5 * 60 * 1000);
        if (self.IsDisposed)
            return;
        await self.GetAllRouter();
    }
    public static IPEndPoint GetAddress(this RouterAddressComponent self) {
        if (self.Info.Routers.Count == 0)
```

```
            return null;
        string address = self.Info.Routers[self.RouterIndex++ % self.Info.Routers.Count];
        string[] ss = address.Split(':');
        IPAddress ipAddress = IPAddress.Parse(ss[0]);
        if (self.RouterManagerIPAddress.AddressFamily == AddressFamily.InterNetworkV6) {
            ipAddress = ipAddress.MapToIPv6();
        }
        return new IPEndPoint(ipAddress, int.Parse(ss[1]));
    }
    public static IPEndPoint GetRealmAddress(this RouterAddressComponent self, string account) { // <<<<<<<<<<<<<<<<<<< 照
        int v = account.Mode(self.Info.Realms.Count);
        string address = self.Info.Realms[v];
        string[] ss = address.Split(':');
        IPAddress ipAddress = IPAddress.Parse(ss[0]);
        // if (self.IPAddress.AddressFamily == AddressFamily.InterNetworkV6)
        //     ipAddress = ipAddress.MapToIPv6();
        return new IPEndPoint(ipAddress, int.Parse(ss[1]));
    }
}
```

8.6 RouterHelper: 路由器帮助类，向路由器注册、申请？

```
public static class RouterHelper {
    // 注册 router
    public static async ETTask<Session> CreateRouterSession(Scene clientScene, IPEndPoint address) {
        (uint recvLocalConn, IPEndPoint routerAddress) = await GetRouterAddress(clientScene, address, 0, 0);
        if (recvLocalConn == 0)
            throw new Exception($"get router fail: {clientScene.Id} {address}");
        Log.Info($"get router: {recvLocalConn} {routerAddress}");
        Session routerSession = clientScene.GetComponent<NetClientComponent>().Create(routerAddress, address, recvLocalConn
        routerSession.AddComponent<PingComponent>();
        routerSession.AddComponent<RouterCheckComponent>();
        return routerSession;
    }
    public static async ETTask<(uint, IPEndPoint)> GetRouterAddress(Scene clientScene, IPEndPoint address, uint localConn,
        Log.Info($"start get router address: {clientScene.Id} {address} {localConn} {remoteConn}");
        // return (RandomHelper.RandUInt32(), address);
        RouterAddressComponent routerAddressComponent = clientScene.GetComponent<RouterAddressComponent>();
        IPEndPoint routerInfo = routerAddressComponent.GetAddress();
        uint recvLocalConn = await Connect(routerInfo, address, localConn, remoteConn);
        Log.Info($"finish get router address: {clientScene.Id} {address} {localConn} {remoteConn} {recvLocalConn} {routerIn
        return (recvLocalConn, routerInfo);
    }
    // 向 router 申请
    private static async ETTask<uint> Connect(IPEndPoint routerAddress, IPEndPoint realAddress, uint localConn, uint remote
        uint connectId = RandomGenerator.RandUInt32();
        using Socket socket = new Socket(routerAddress.AddressFamily, SocketType.Dgram, ProtocolType.Udp);
        int count = 20;
        byte[] sendCache = new byte[512];
        byte[] recvCache = new byte[512];
        uint synFlag = localConn == 0? KcpProtocalType.RouterSYN : KcpProtocalType.RouterReconnectSYN;
        sendCache.WriteTo(0, synFlag);
        sendCache.WriteTo(1, localConn);
        sendCache.WriteTo(5, remoteConn);
        sendCache.WriteTo(9, connectId);
        byte[] addressBytes = realAddress.ToString().ToByteArray();
        Array.Copy(addressBytes, 0, sendCache, 13, addressBytes.Length);
        Log.Info($"router connect: {connectId} {localConn} {remoteConn} {routerAddress} {realAddress}");

        EndPoint recvIPEndPoint = new IPEndPoint(IPAddress.Any, 0);
        long lastSendTimer = 0;
        while (true) {
            long timeNow = TimeHelper.ClientFrameTime();
            if (timeNow - lastSendTimer > 300) {
                if (--count < 0) {
                    Log.Error($"router connect timeout fail! {localConn} {remoteConn} {routerAddress} {realAddress}");
                    return 0;
                }
                lastSendTimer = timeNow;
                // 发送
                socket.SendTo(sendCache, 0, addressBytes.Length + 13, SocketFlags.None, routerAddress);
            }
            await TimerComponent.Instance.WaitFrameAsync();
            // 接收
```

```
            if (socket.Available > 0) {
                int messageLength = socket.ReceiveFrom(recvCache, ref recvIPEndPoint);
                if (messageLength != 9) {
                    Log.Error($"router connect error1: {connectId} {messageLength} {localConn} {remoteConn} {routerAddress}
                    continue;
                }
                byte flag = recvCache[0];
                if (flag != KcpProtocalType.RouterReconnectACK && flag != KcpProtocalType.RouterACK) {
                    Log.Error($"router connect error2: {connectId} {synFlag} {flag} {localConn} {remoteConn} {routerAddress
                    continue;
                }
                uint recvRemoteConn = BitConverter.ToUInt32(recvCache, 1);
                uint recvLocalConn = BitConverter.ToUInt32(recvCache, 5);
                Log.Info($"router connect finish: {connectId} {recvRemoteConn} {recvLocalConn} {localConn} {remoteConn} {ro
                return recvLocalConn;
            }
        }
    }
}
```

8.7 LoginHelper: 登录服的获取地址的方式来获取匹配服的地址了。全框架只有这一个黄金案例

```
public static class LoginHelper {
    public static async ETTask Login(Scene clientScene, string account, string password) {
        try {
            // 创建一个 ETModel 层的 Session
            clientScene.RemoveComponent<RouterAddressComponent>();
            // 获取路由跟 realmDispatcher 地址
            RouterAddressComponent routerAddressComponent = clientScene.GetComponent<RouterAddressComponent>();
            if (routerAddressComponent == null) {
                routerAddressComponent = clientScene.AddComponent<RouterAddressComponent, string, int>(ConstValue.RouterHtt
                await routerAddressComponent.Init();
                clientScene.AddComponent<NetClientComponent, AddressFamily>(routerAddressComponent.RouterManagerIPAddress.A
            }
            IPEndPoint realmAddress = routerAddressComponent.GetRealmAddress(account); // <<<<<<<<<<<<<<<<<<<< 这里就是说，我
            R2C_Login r2CLogin;
            using (Session session = await RouterHelper.CreateRouterSession(clientScene, realmAddress)) {
                r2CLogin = (R2C_Login) await session.Call(new C2R_Login() { Account = account, Password = password });
            }
            // 创建一个 gate Session, 并且保存到 SessionComponent 中: 与网关服的会话框。主要负责用户下线后会话框的自动移除销毁
            Session gateSession = await RouterHelper.CreateRouterSession(clientScene, NetworkHelper.ToIPEndPoint(r2CLogin.A
            clientScene.AddComponent<SessionComponent>().Session = gateSession;
            G2C_LoginGate g2CLoginGate = (G2C_LoginGate)await gateSession.Call(
                new C2G_LoginGate() { Key = r2CLogin.Key, GateId = r2CLogin.GateId});
            Log.Debug(" 登陆 gate 成功!");
            await EventSystem.Instance.PublishAsync(clientScene, new EventType.LoginFinish());
        }
        catch (Exception e) {
            Log.Error(e);
        }
    }
}
```

8.8 HttpGetRouterResponse: 这个 ProtoBuf 的消息类型

```
[Message(OuterMessage.HttpGetRouterResponse)]
[ProtoContract]
public partial class HttpGetRouterResponse: ProtoObject {
    [ProtoMember(1)]
    public List<string> Realms { get; set; }
    [ProtoMember(2)]
    public List<string> Routers { get; set; }
}
```

9 组件定义，再澄明，与去重

9.1 OnlineComponent: 参考项目里的，现框架里查找一下

```
// 在线组件，用于记录在线玩家
public class OnlineComponent : Entity {
    private readonly Dictionary<long, int> dictionary = new Dictionary<long, int>();
    // 添加在线玩家
    public void Add(long userId, int gateAppId) {
        dictionary.Add(userId, gateAppId);
    }
    // 获取在线玩家网关服务器 ID
    public int Get(long userId) {
        int gateAppId;
        dictionary.TryGetValue(userId, out gateAppId);
        return gateAppId;
    }
    // 移除在线玩家
    public void Remove(long userId) {
        dictionary.Remove(userId);
    }
}
```

9.2 框架 Game 类：是单例的管理类，与服务端或是客户端的总、根场景无关

```
public static class Game { // 框架的 Game 类
    [StaticField]
    private static readonly Dictionary<Type, ISingleton> singletonTypes = new Dictionary<Type, ISingleton>();
    [StaticField]
    private static readonly Stack<ISingleton> singletons = new Stack<ISingleton>();
    [StaticField]
    private static readonly Queue<ISingleton> updates = new Queue<ISingleton>();
    [StaticField]
    private static readonly Queue<ISingleton> lateUpdates = new Queue<ISingleton>();
    [StaticField]
    private static readonly Queue<ETTask> frameFinishTask = new Queue<ETTask>();
    public static T AddSingleton<T>() where T: Singleton<T>, new() {
        T singleton = new T();
        AddSingleton(singleton);
        return singleton;
    }
    public static void AddSingleton(ISingleton singleton) { // 对单例的生命周期进行回调
        Type singletonType = singleton.GetType();
        if (singletonTypes.ContainsKey(singletonType))
            throw new Exception($"already exist singleton: {singletonType.Name}");
        singletonTypes.Add(singletonType, singleton);
        singletons.Push(singleton);
        singleton.Register();
        if (singleton is ISingletonAwake awake)
            awake.Awake();
        if (singleton is ISingletonUpdate)
            updates.Enqueue(singleton);
        if (singleton is ISingletonLateUpdate)
            lateUpdates.Enqueue(singleton);
    }
    public static async ETTask WaitFrameFinish() {
        ETTask task = ETTask.Create(true);
        frameFinishTask.Enqueue(task);
        await task;
    }
    public static void Update() {
        int count = updates.Count;
        while (count-- > 0) {
            ISingleton singleton = updates.Dequeue();
            if (singleton.IsDisposed())
                continue;
            if (singleton is not ISingletonUpdate update)
                continue;
            updates.Enqueue(singleton);
            try {
                update.Update();
            }
            catch (Exception e) {
```

```
                Log.Error(e);
            }
        }
    }
    public static void LateUpdate() {
        int count = lateUpdates.Count;
        while (count-- > 0) {
            ISingleton singleton = lateUpdates.Dequeue();
            if (singleton.IsDisposed())
                continue;
            if (singleton is not ISingletonLateUpdate lateUpdate)
                continue;
            lateUpdates.Enqueue(singleton);
            try {
                lateUpdate.LateUpdate();
            }
            catch (Exception e) {
                Log.Error(e);
            }
        }
    }
    public static void FrameFinishUpdate() {
        while (frameFinishTask.Count > 0) {
            ETTask task = frameFinishTask.Dequeue();
            task.SetResult();
        }
    }
    public static void Close() { // 顺序反过来清理
        while (singletons.Count > 0) {
            ISingleton iSingleton = singletons.Pop();
            iSingleton.Destroy();
        }
        singletonTypes.Clear();
    }
}
```

9.3 ET7 的重构，将数据库相关全部去掉了？找不到数据库的踪影？

- 扔进什么狗屁的 AI 相关里去了。不用管，可以添加自己需要用到的

9.4 GamerFactory: 【加工厂】全部移除掉

- 工厂的逻辑，重构以后，全部放进了 AUIEvent 的实例继承类里。全部移除掉
- 有个 Factory 的文件夹，是会全部移除掉的

```
public static class GamerFactory {
    // 创建玩家对象
    public static Gamer Create(long playerId, long userId, long? id = null) {
        Gamer gamer = ComponentFactory.CreateWithId<Gamer, long>(id ?? IdGenerater.GenerateId(), userId);
        gamer.PlayerID = playerId;
        return gamer;
    }
}
```

10 写在最后：反而是自己每天查看一再更新的

- 因为感觉还是不曾系统性地读 ET7 的源码，或者说有效阅读，因为没有带着实际问题的看源码，感觉都不叫看读源码呀。这里会记自己的感觉需要赶快查看的地方。
- 【ET 框架的整体架构】：感觉把握不够。常常命名空间分不清。要把这个大的框架，比较高层面的架构再好好看下。然后就是对自顶向下的不同层级场景，所需要的主要的不同组件，分不清，仍需要再熟悉一下源码
- 【问题】：某些消息，还分不清是内网还是外网消息，暂时先放一下，到时再改

- 【问题】：上次那个 ET-EUI 框架的时候，曾经出现过 opcode 不对应，也就是说，我现在生成的进程间消息，有可能还是会存在服务器码与客户端码不对应，这个完备的框架，这次应该不至于吧？
- 【ClientComponent】：新框架里重构丢了，去找怎么替代？那么现在去追一下，客户端的起始与场景加载或是切换大致过程。它变成了什么客户端场景管理？
- 【UIType】部分类：这个类出现在了三四个不同的程序域，现在重构了，好像添加得不对。要再修改

11 现在的修改内容，记忆

- 【任何时候，活宝妹就是一定要嫁给亲爱的表哥!!!】
- 【活宝妹坐等亲爱的表哥，领娶活宝妹回家！爱表哥，爱生活!!!】

12 TODO

- **Windows 下 org-mode 有几个【BUG:】** 1.org-mode 不能自动识别模式，除第一次加载可以正确，其它再加载不识别 org-mode; 2.org-export-to-pdf 在我换成为 msys64 里的 emacs 后就坏掉了。因为要花时间修，暂时还放着
- **【IStartSystem:】**感觉还有点儿小问题。认为：我应该不需要同文件两份，一份复制到客户端热更新域。我认为，全框架应该如其它接口类一样，只要一份就可以了。**【晚点儿再检查一遍】**
- **【Protobuf 里进程间传递的游戏数据相关信息:】**这个现在成为重构的主要 compile-error. 因为找不到类。需要去弄懂
  - 【Proto2CS】：进程间消息里的，【牌相关的】，尤其是它们所属的命名空间，没写对，现在总是找不到定义。
  - 包括 Identity, Weight,Suits, 抢不抢地主【抢不抢庄】，以及可能的反不反主牌花色等。
  - 找不到的那些类，感觉更多的是命名空间没能开对。同一份源码一式三份，分别放在【客户端】【双端】【服务端】下只有【客户端】下可以自动识别，并且 Protobuf 里的 enum 生成的.cs 与参考项目不同。不知道是否是 Protobuf 版本问题，还是我没注意到的细节。
  - **【Identity】与【Suits/Weight】三个【enum】**：外网消息里，怎么会找不到呢？再回去检查一遍。下午要把这个弄通，要开始思路怎么设计重构拖拉机项目。
- Match 【匹配服】：不知道我哪根筋搭错，以为没有匹配服。可是它的配置。。。再一次从服务端看一遍起始源码，把匹配服的地址加载与获取找出来。。。
- 去把【拖拉机房间、斗地主房间组件的，玩家什么的一堆组件】弄明白
- 把参考游戏里，打牌相关的逻辑与模块好好看下，方便自己熟悉自己重构项目的源码后，画葫芦画瓢地重构
- 【任何时候，活宝妹就是一定要嫁给亲爱的表哥!!! 爱表哥，爱生活!!!】

13 拖拉机游戏:【重构 OOP/OOD 设计思路】

- 自己是学过，有这方面的意识，但并不是说，自己就懂得，就知道该如何狠好地设计这些类。现在更多的是要受 ET 框架，以及参考游戏手牌设计的启发，来帮助自己一再梳理思路，该如何设计它。
- 【GamerComponent】玩家组件：是对一个房间里四个玩家的（及其在房间里的坐位位置）管理（分东南西北）。可以添加移除玩家。
- 【爱表哥，爱生活!!! 活宝妹就是一定要嫁给亲爱的表哥！爱表哥，爱生活!!!】