



GST 14 – Events and Networks

Formal Description

An **event** is a time-bounded instance of a causal relationship involving the transfer of matter, energy, or information, resulting in a change of state of one or more entities.

A **network** is a configuration of entities connected by causal relationships. Networks consist of interconnected events and relationships through which transfers propagate across systems.

While events are discrete occurrences in time, networks represent the ongoing structure of interconnected causal relationships.

Plain English Explanation

We have seen that causal relationships involve transfers between entities. The next step is to understand what happens when these transfers occur over time, and how many such interactions connect together. This leads us to the concepts of events and networks.

An event is something that happens at a particular time. More precisely, an event occurs when a transfer takes place and produces a change in one or more entities. For example, a ball hitting the ground, a message being received, or heat flowing into an object are all events. In each case, something happens over a period of time, a transfer occurs, and the state of the system changes. Events are therefore the basic units of change in the world.

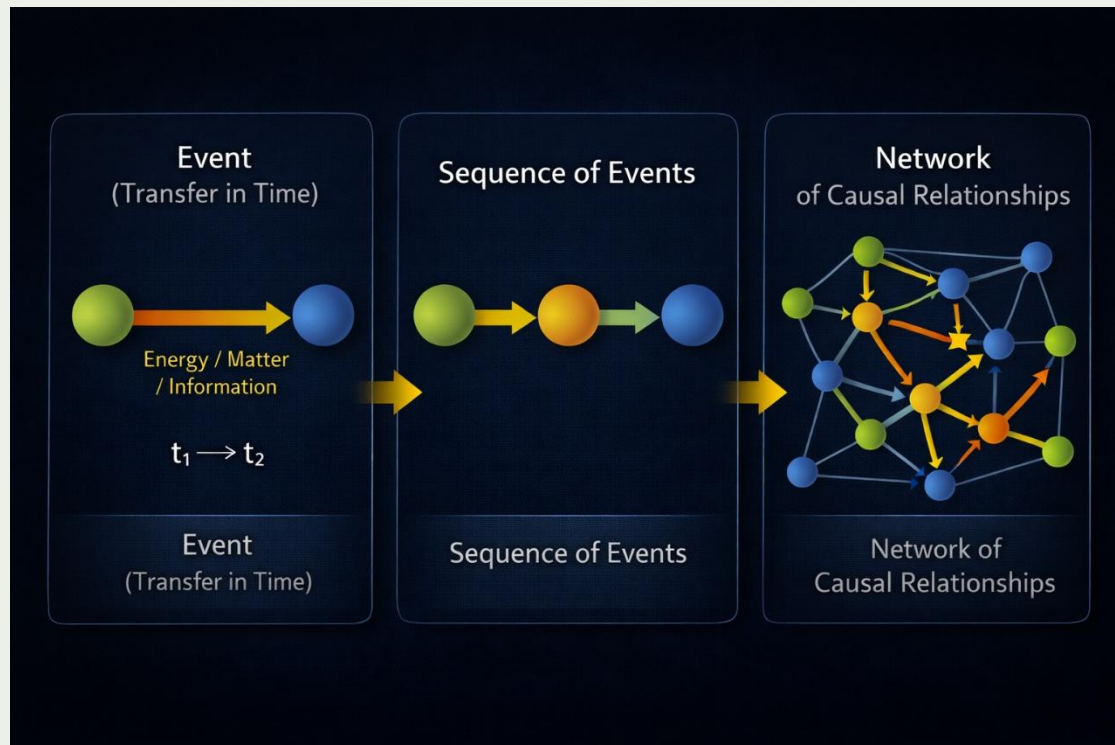
Events are important because they link one moment to the next by producing changes of state. Without events, nothing would change and systems would remain static. It is through events that processes unfold and systems evolve over time.

In practice, events rarely occur in isolation. Instead, they are connected together in networks of interactions. A network consists of entities connected by many causal relationships, where each connection involves transfers and therefore events. Examples include food webs, communication systems, and transport networks, all of which involve many interconnected interactions occurring over time.

A single event represents one interaction, but a network represents many interactions linked together. These networks form the basis of systems, as systems are composed of interconnected processes rather than isolated events.

Networks combine two essential aspects: configuration and transfer. Configuration determines which entities are connected, while transfer describes what flows between them. For example, in a transport system, roads define the configuration, while traffic represents the flow. Both are necessary to understand how the network operates.

This is crucial for systems theory because events explain how change occurs, while networks explain how complex behaviour emerges. Systems, in this sense, can be understood as networks of interconnected events unfolding over time.



Example 1 – A Ball Bouncing

A ball falling and hitting the ground:

- energy is transferred
- the ball changes direction

☞ This is a single **event**.

Example 2 – Communication

A message sent from one person to another:

- information is transferred
- the receiver's state changes (they now know something)

☞ This is an **event**, and part of a communication network.

Example 3 – Food Web

In an ecosystem:

- energy flows from plants to herbivores to predators

☞ Many events connect together to form a **network**.

Example 4 – Transport System

In a city:

- roads connect locations (configuration)
- vehicles move between them (events and flows)

☞ This forms a **transport network**.



Provenance and Links

This module draws on foundational concepts from physics, systems theory, and network science concerning events, interactions, and interconnected systems.

The concept of an event as a time-bound occurrence involving change is central to physics, where interactions are understood as processes unfolding over time. In both classical and modern physics, change is described in terms of interactions involving the transfer or transformation of matter, energy, or information within space-time.

The idea that multiple interactions form interconnected networks aligns with developments in systems theory and complexity science. In particular, the representation of systems as networks of interacting components is central to the work of Ludwig von Bertalanffy, where systems are understood as organised sets of interacting elements rather than isolated entities.

The analysis of networks as structures of interconnected relationships has been developed further in network science, including the work of Albert-László Barabási, where complex systems are modelled as nodes connected by interactions. In this context, individual interactions correspond to events, while large-scale patterns of interaction give rise to network structure and behaviour.

The distinction between individual events and networks of events also connects to broader ideas in complexity theory, where system behaviour emerges from many interacting processes occurring over time. Networks therefore provide a framework for understanding how local interactions give rise to global patterns.

Within General Systems Theory, these ideas support the understanding of systems as networks of interconnected events. Events describe the basic units of change, while networks describe how these changes are linked together across space and time. This provides a foundation for analysing causality, processes, and system dynamics in subsequent modules.

Practical Exercise – Student Response Area

Choose a real-world example (e.g. a conversation, a machine, or a natural system).

1. Identify one **event** (a specific transfer causing change)
2. Identify a **sequence of events**
3. Describe how these events connect to form a **network**
4. Reflect:
 - How does the network differ from a single event?

👉 Write a short paragraph describing your example.