# INTRO

• In IOTA the word weight can be used in different ways.

• You have "own weight", "cumulative weight" and "minimum weight magnitude".

• In this video I will explain what these three words means.

OWN WEIGHT AND CUMULATIVE WEIGHT

- Every transaction has an initial weight called the own weight and can have the values 1, 3, 9, etc (3^n).

- The own weight is determined by the effort put by its issuing node.
  For this tutorial it is not important to know how this value is calculated.

- The cumulative weight of a transaction is the transaction own weight plus the sum of all weights of all transactions that directly or indirectly approve this transaction.
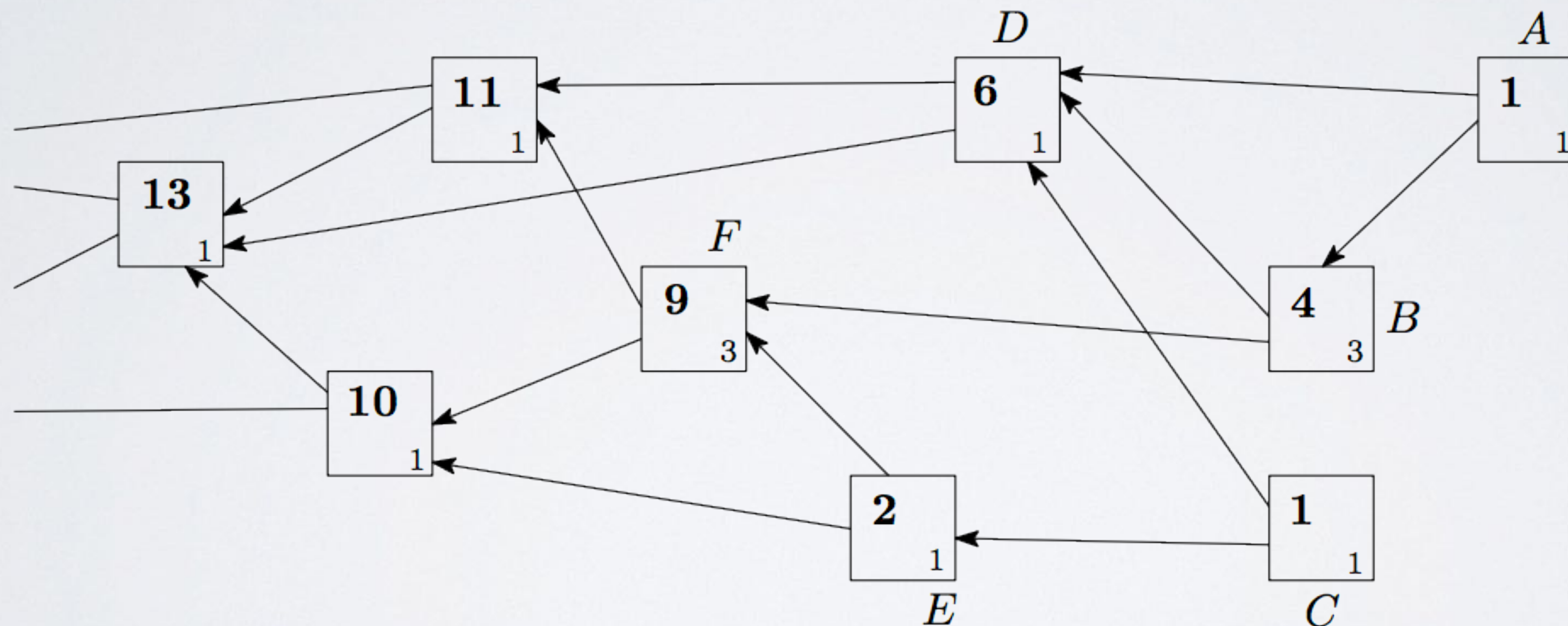
OWN WEIGHT AND CUMULATIVE WEIGHT

- The small numbers are the transactions own weight.
 The bold numbers are the transactions cumulative weight.
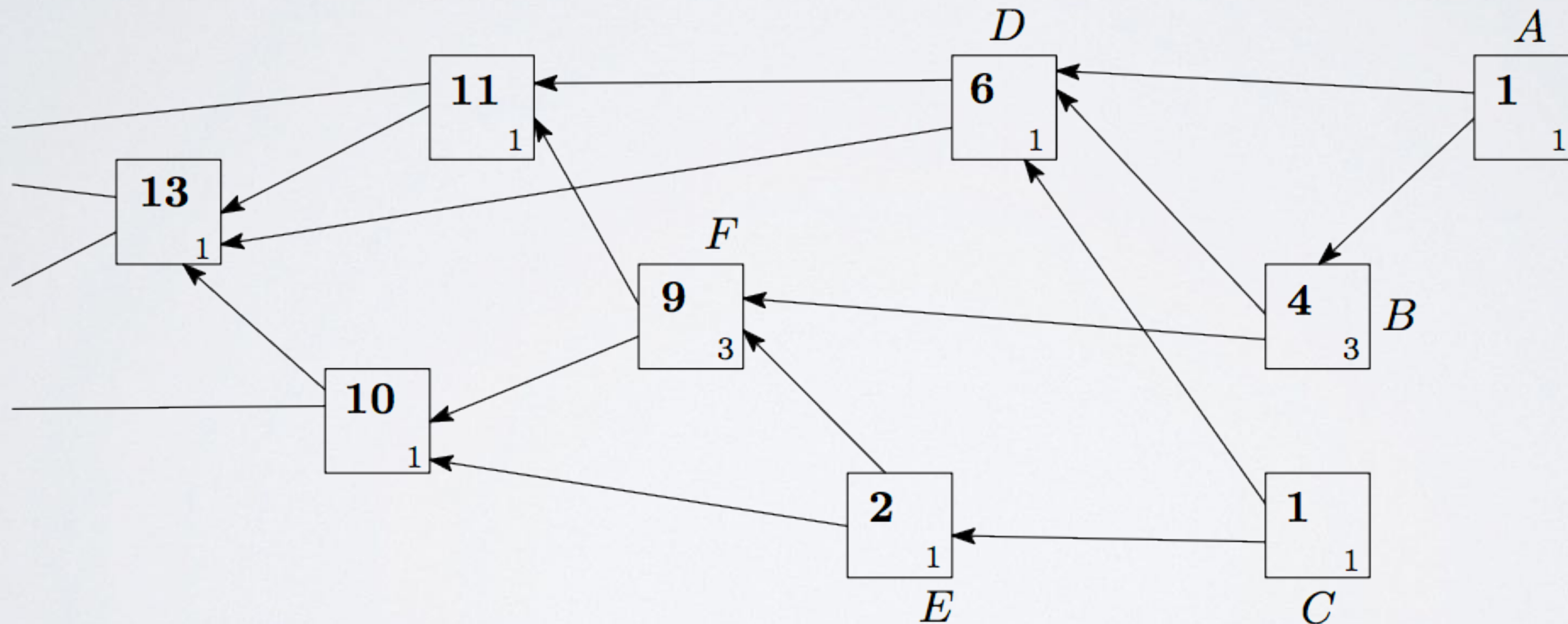
OWN WEIGHT AND CUMULATIVE WEIGHT

- For example, transaction F is directly or indirectly approved by transactions A, B, C and E. The cumulative weight of F is 9 = 3 + 1 + 3 + 1 + 1, which is the sum of the own weight of F and the own weights of A, B, C, and E.

OWN WEIGHT AND CUMULATIVE WEIGHT

- For example, transaction D is directly or indirectly approved by transactions A, B and C. The cumulative weight of D is 6 = 1 + 1 + 3 + 1, which is the sum of the own weight of D and the own weights of A, B and C.
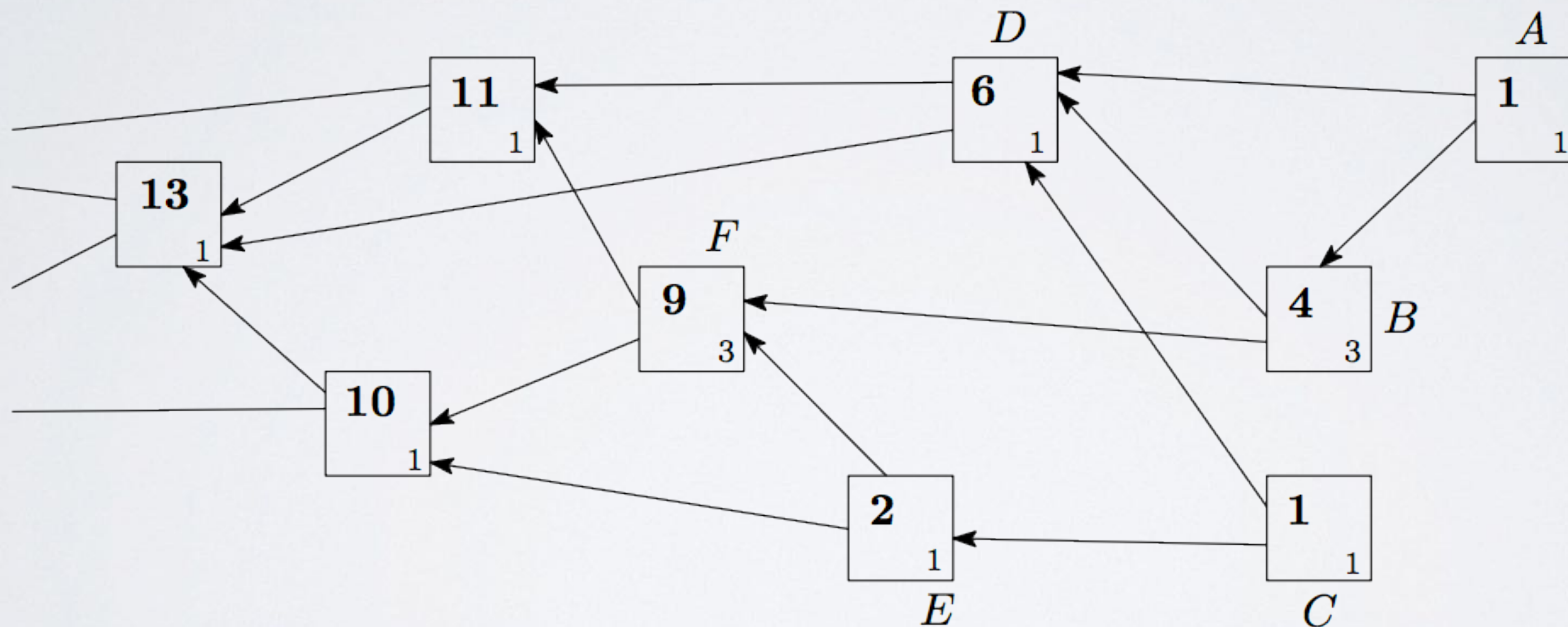
OWN WEIGHT AND CUMULATIVE WEIGHT

- The cumulative weight is a very important metric for transactions on its way to network approval.

- A transaction with a larger cumulative weight is more "important" than a transaction with a smaller cumulative weight.

- Each new transaction added to the tangle increases the ancestors cumulative weight by the weight of that transaction. Older transactions grows in importance over time.

- The use of cumulative weights avoid spamming and other attack styles, it is assumed that no entity can generate an abundance of transactions with "acceptable" cumulative weights in a short period of time.

MINIMUM WEIGHT MAGNITUDE

• The Minimum Weight Magnitude (MWM) is the difficulty of Proof of Work.

• IOTA's proof of work algorithm is similar to Hashcash.

• The Minimum Weight Magnitude is the number of trailing zeros.

• A simplified explanation how Hashcash works (Lets assume MWM=4):

   • hash(transaction data + counter) = **...9f86d081884c7d659**   (PoW not ok)

   • hash(transaction data + counter) = **...884633bce1d660000**   (PoW ok)

MINIMUM WEIGHT MAGNITUDE

- On the mainnet the minWeightMagnitude = 14 (Applies to IRI release: v1.4.1.2)

- On the testnet the minWeightMagnitude = 9 (Applies to IRI release: testnet-v1.4.1.2)

- Higher minWeightMagnitude values should be no problem but will just cause the Proof of Work to take longer unnecessarily.

- The Minimum Weight Magnitude changes, see file Configuration.java.
  For example:
  https://github.com/iotaledger/iri/tree/v1.4.1.2/src/main/java/com/iota/iri/conf/
  Configuration.java