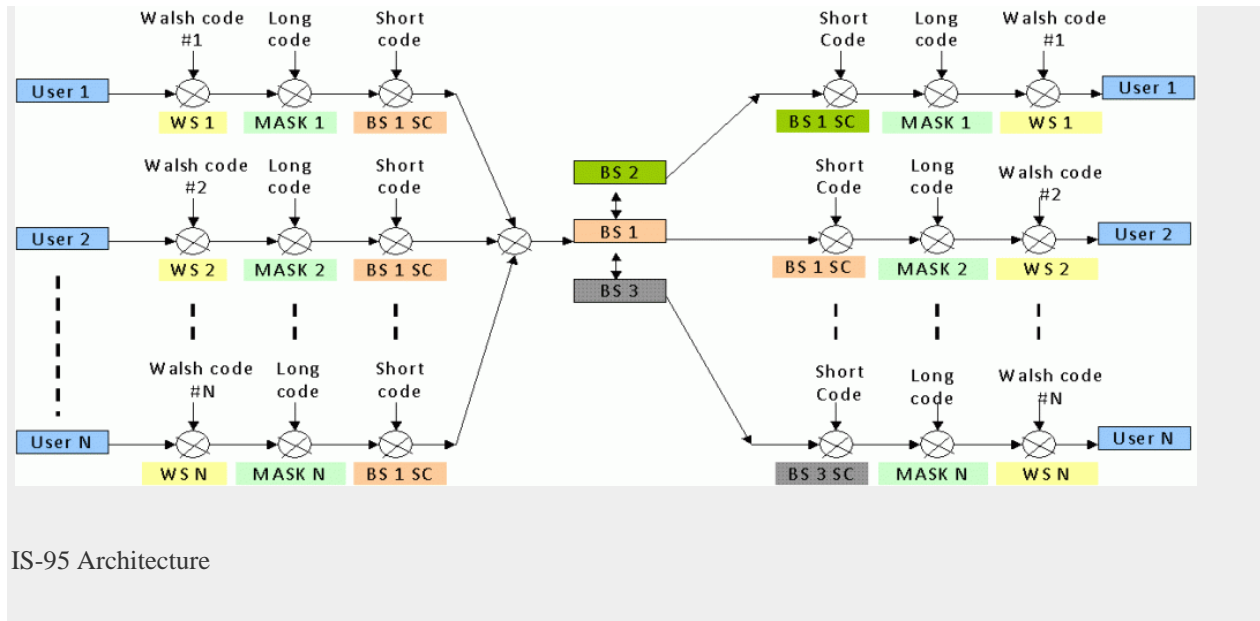


CODES USED IN CDMA

IS-95 CDMA Standard uses three types of codes namely 1) Long code 2) Short code and 3) [Walsh Hadamard codes](#).



Long Code:

Long codes run at 1.2288 Mb/s and are 42 bits long (created using a 42 bits LFSR register). It takes approx 41.2 days to repeat a long code at this rate. It is used for both encryption and spreading. Encryption is achieved by using a mask called Long Code mask which is created using a 64-bit authentication key called A-key (assigned by CAVE protocol) and Electronic Serial Number (ESN – assigned each user based on the mobile number). The Long code changes each time a new connection is created.

Short Code:

Short code is a m-sequence of length 2¹⁵-1 (created using a 15 bit LFSR register) and is used for synchronization purpose in the forward as well as reverse links. The short code is also used to identify

cell/base station connection in the forward link. It repeats approx 75 times in 2 seconds. Each base station is assigned a cyclically shifted version of same short code sequence to differentiate the base stations. This is also called PN offset in CDMA jargon. Since the cyclically shifted versions of a same m-sequence offer poor correlation, it is easier to differentiate between different base station links.

During the initial call setup stage, a mobile phone tries to find a base station (in 2 seconds max allowed time), if it find a base station, the mobile phone is validated using a database by the base station and is assigned a PN Short code sequence. This PN short code sequence uniquely identifies the connection between the particular base station and the mobile devices served under that base station.

In reality two short code sequences are used one for I channel and another for Q channel (used in spreading and de-spreading).

Walsh Hadamard Code:

CDMA used another type of code called Walsh Hadamard Code. In IS-95 CDMA, 64 Walsh codes are used per base station. This enables to create 64 separate channels per base stations (i.e. a base station can handle maximum 64 unique users at a given time). In CDMA-2000 standard, 256 Walsh codes are used to handle maximum 256 unique users under a base.

Walsh codes are created using Hadamard Matrix and transform. The codes under a family of Walsh codes, possess a beautiful property of being orthogonal to each other.

Source: <http://www.gaussianwaves.com/2011/02/codes-used-in-cdma-2/>