The chapter represents a comparison of ultrapower fields (loosely surreals,
hyper-reals, long line) and number fields generated by infinite primes
having a physical interpretation in Topological Geometrodynamics.

Ultrapower fields are discussed in very physicist friendly manner in the
articles of Elemer Rosinger and these articles are taken as a convenient
starting point. The physical interpretations and principles proposed by
Rosinger are considered against the background provided by TGD. The
construction of ultrapower fields is associated with physics using the
close analogies with gauge theories, gauge invariance, and with the
singularities of classical fields.

Non-standard numbers are compared with the numbers generated by infinite
primes and it is found that the construction of infinite primes, integers,
and rationals has a close similarity with construction of the generalized
scalars. The construction replaces at the lowest level the index set
$\Lambda=\mathbb{N}$ of natural numbers with algebraic numbers
$\mathbb{A}$, Frechet filter of $\mathbb{N}$ with that of $\mathbb{A}$,
and $\mathbb{R}$ with unit circle S^1 represented as complex numbers of
unit magnitude. At higher levels of the hierarchy generalized –possibly
infinite and infinitesimal– algebraic numbers emerge. This correspondence
maps a given set in the dual of Frechet filter of $\mathbb{A}$ to a
phase factor characterizing infinite rational algebraically so that
correspondence is like representation of algebra.

The basic difference between two approaches to infinite numbers is that
the counterpart of infinitesimals is infinitude of real units with complex
number theoretic anatomy: one might loosely say that these real units are
exponentials of infinitesimals.