The Cell

- The basic electrochemical unit with the electrochemical voltage of the couple
  - ~3.5 to 4.5 volts
- Contiguous electrolyte pool
- A positive and negative terminal
- Normally no electronics (except as a single cell battery)

Subject to following UN Tests
T1 – Altitude  T3 – Vibration  T5 – Short Circuit
T2 – Thermal  T4 – Shock  T6 – Impact  T8 – Forced Discharge

Cylindrical

Pouch

Prismatic

Custom Shapes

Courtesy of Yardney Technical Products, Inc.
Battery (Module)

- Group of cells that are electrically and physically connected together in a manner appropriate for the application and environment

- Electronics for balancing, monitoring and signaling

- May not have complete electronics (i.e. fuses, diodes or circuit breaker) at this level due to reliability needs or power levels

- Must be professionally installed into a battery assembly to function as designed

Subject to following UN Tests:
- T1 – Altitude
- T2 – Thermal
- T3 – Vibration
- T4 – Shock
- T5 – Short Circuit
- T7 – Overcharge

NOT a Module! Just Cells in Cell Holder
Li-ion Battery & Battery Assemblies

- An electrically and physically connected group of cells (battery) or modules (battery assembly) with a complete electronics, physical packaging appropriate for the application and the communications and power connections which mate with the device it will power.

- Has all safety devices functional at the terminals of the battery
  - Overcharge (redundant protection absolutely essential)
  - Over current (fuses or switches)
  - Over temp (may have cooling system or current limiter)
  - Physical protections for vib/shock/drop/moisture/heat/etc.
  - Vents or other over-pressure safety devices

- Can be any combination of series and parallel as long as they are all within the same control system’s purview

Subject to following UN Tests (if ≤ 6200 Wh)
(T3 – Vibration  T4 – Shock  T5 – Short Circuit  T7 – Overcharge)
To add to the confusion:

- One cell with safety devices and connections and enclosure is a battery.
- Multiple batteries or battery assemblies may be able to be connected in series or parallel reliably in an application:
  - Depends on the electronics
  - If they can, then next level is a Battery Assembly
  - Impossible to test some of these due to size.
- Battery Assemblies may be spread in multiple physical locations:
  - Vehicle battery assemblies in several smaller compartments
  - Submarine battery assemblies in multiple tubes or boxes.