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Given an arrangement of complex hyperplanes, the cohomology algebras of its wonderful compactifications in the sense of DeConcini & Procesi can be fully described in terms of the intersection lattice and of so-called building sets, suitably chosen families of intersections in the arrangement. We show that these algebras bear yet another, seemingly unrelated, geometric meaning: they are the Chow rings of (non-complete) toric varieties constructed from the intersection lattice and the building sets of the arrangement. (Received August 15, 2002)