The Geographic Electromagnetic Radiation Domain Control System, part II (GERDCS™)

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Abstract

The Geographic Electromagnetic Radiation Domain Control System (GERDCS™), part II

Adjustments to convert previous presentation to SDD semantics and model

Scalable Distributed or Centralized Model

- **The proposed system is a set of interconnected services**
  - In a single device or in an intranet or internet of networked of devices
- **Consisting of at least one instance of each of the following**
  - Spectrum User (SU) - transmitting/receiving device
  - Coexistence Enabler (CE)
  - Coexistence Database Server (CDS)
  - Coexistence DNS Server
  - TV white Space (TVWS) regulatory server
- **With operation enhancement optional servers**
  - Geographic/Topographic Resolver (GR)

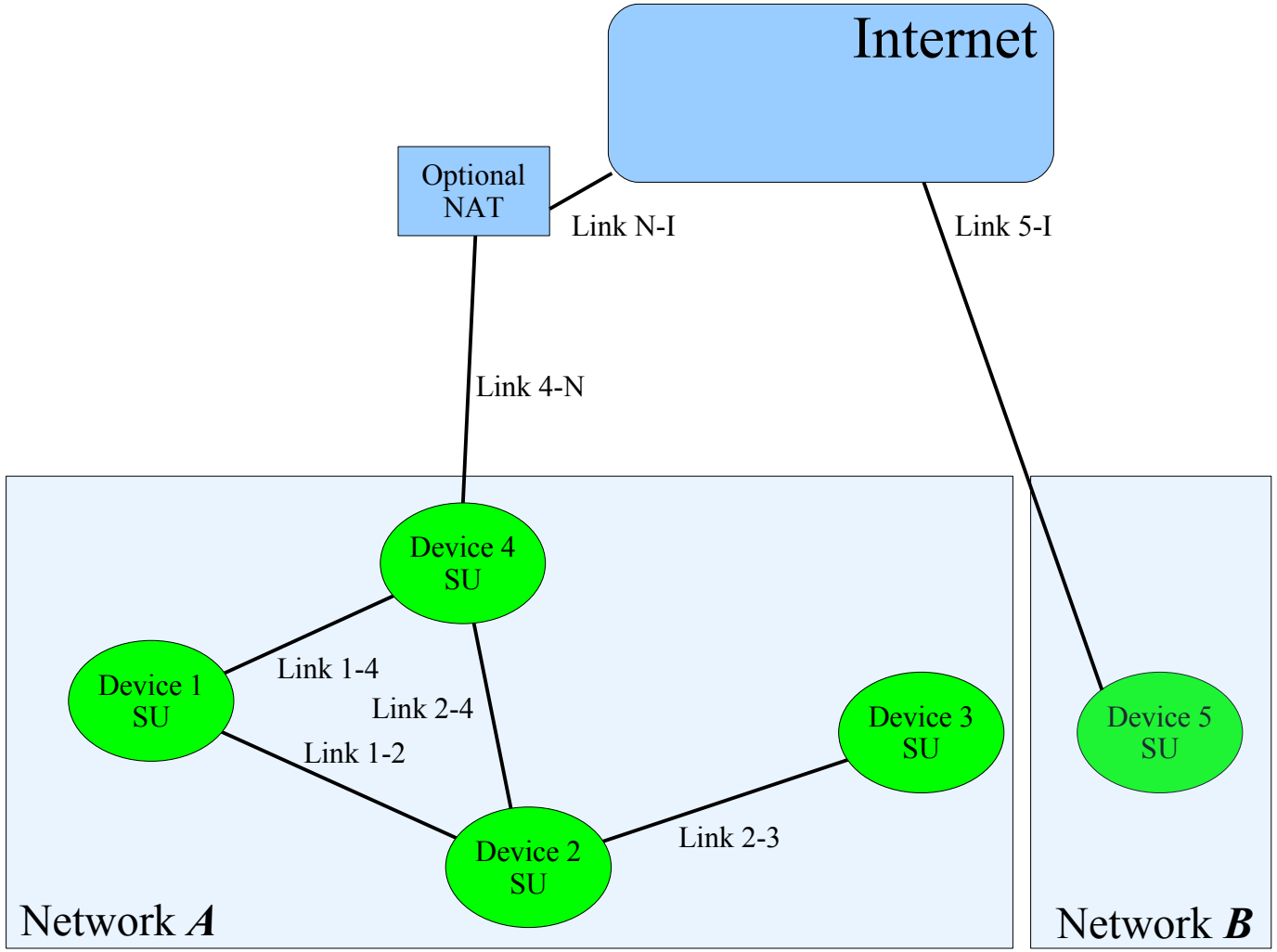
Scalable Distributed or Centralized Model

- **Similar in nature to**
  - The Internet Domain Name System (DNS)
  - That resolves names (URLs) to IP addresses
- **Intends to comply with the needs expressed in**
  - 22-06-0242-09-0002-draft-recommended-practice.doc
  - 19-10-0055-03-0001-system-design-document.pdf
  - With alterations avoiding what WISPs perceive as unacceptable pitfalls

Semantics I

- Throughout this document, a **network** is defined as
  - a set of devices with zero or more links allowing the devices to communicate with each other
    - Links may be wireless, electrical, optical or other suitable media
- A **device** is either
  - a physical object exhibiting a specific behavior and property set
  - an instantiation of a service within one or more physical objects
- A **link** is a point-to-point means of communication between two devices
  - It has a property set. Example properties are
    - speed, delay, distance, reliability, QoS, occupancy
- Multiple links may conglomerate to form link sets
  - In a point to multi-point fashion
  - In a multi-point to multi-point or mesh fashion

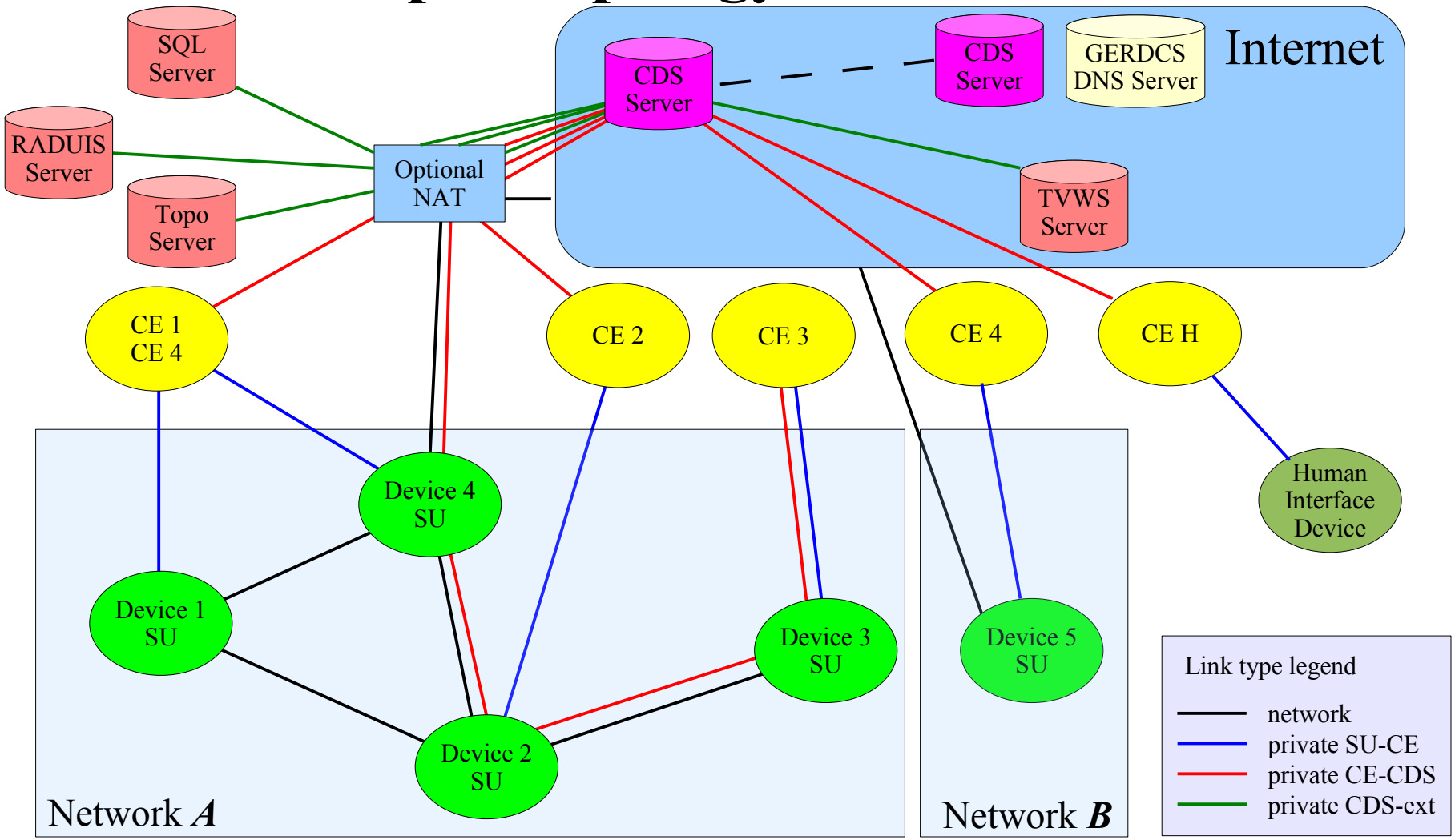
Example Topology Semantics I



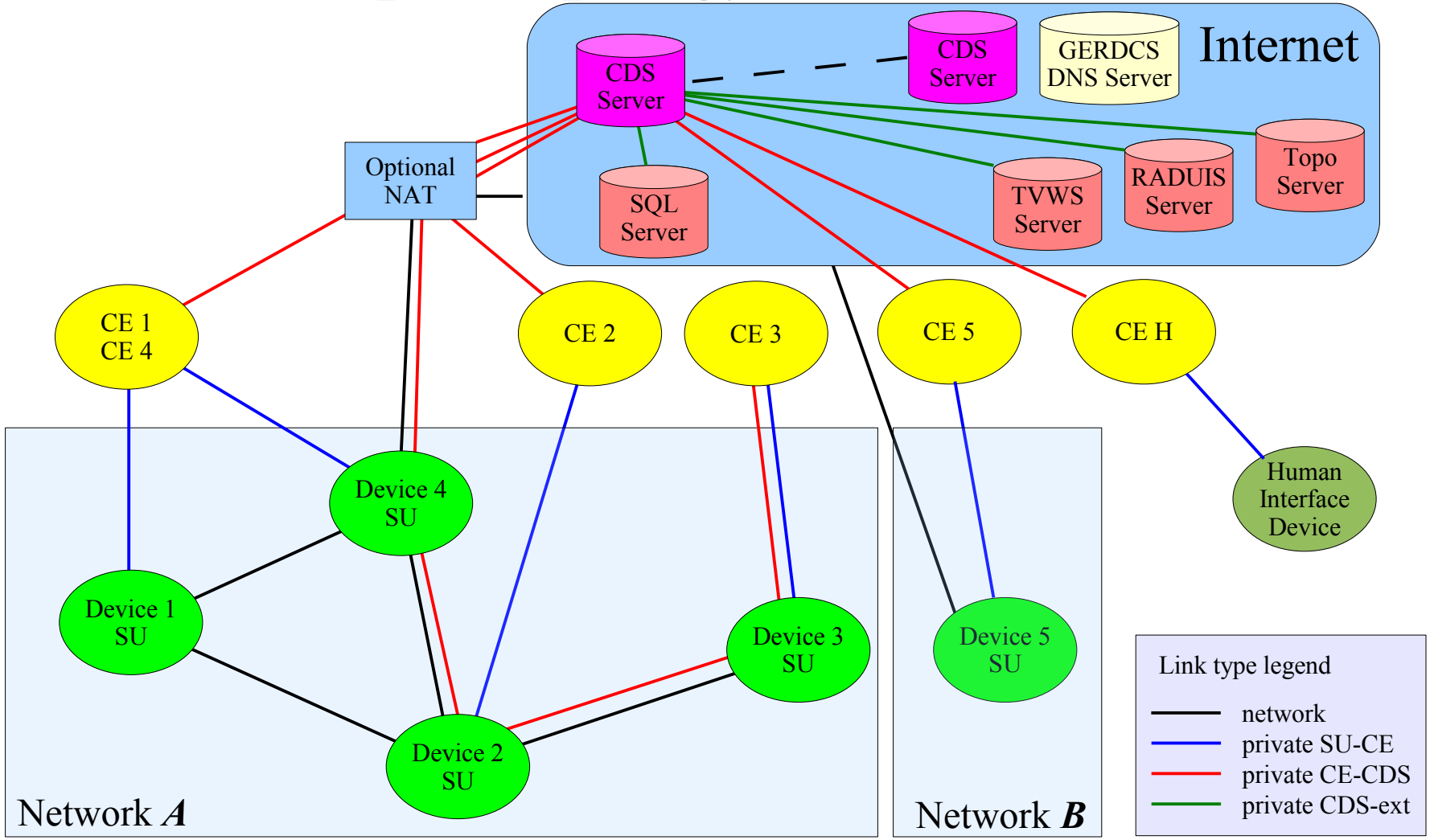
Semantics II

- A **coexistence enabler** is a service that
  - Interfaces devices to the CDS'
- A **coexistence database server** (CDS) is a service that
  - Performs authentication, authorization, accounting (AAA)
  - Encapsulates and protects the database integrity
  - Securely communicates with
    - CE, other CDS'
    - Databases – SQL, RADUIS, Topography, regulatory TVWS, etc
    - Coexistence DNS servers
  - Acts as firewall between clients
    - Provides required communications, including NAT traversal
    - Protects client privacy (if needed)
  - Optionally performs topographic analysis

Example Topology Semantics IIa



Example Topology Semantics IIb



802.19.1 SDD Requirements

- **The system provides for discovery of 802.19.1 compliant TVBD networks and devices**
  - By using a network of SU and CDS
    - Supporting a distributed database model (R7)
    - As well as a centralized database model (R7)
  - With facilities to recognize and traverse NAT firewalls when required
- **Enables various clients to identify 802.19.1 compliant networks or devices**
  - That wish or need to coexist in overlapping radio ranges
  - May take into account
    - Terrain topography
    - Radio propagation conditions

802.19.1 SDD Requirements

- CE devices, normally situated in or communicating with
  - Stations, CPEs, Access Points, Base Stations
  - Act as a proxy between devices and monitor them
  - Obtain and update the regulatory TVWS database data via the CDS
    - Provide status and requested information to the CDS
  - Communicate with and provide updates to the CDS on an ongoing basis
  - May support of other non 802.19.1 compliant devices

802.19.1 SDD Requirements

- Coexistence database servers (CDS')
  - Provide the essential links
    - Between clients
    - To other databases such as topographical and TVWS databases
  - Act as a proxy
    - Allowing controlled communication
    - Between otherwise anonymous clients
    - Via
      - Information storage
      - Exchange of queries and responses
      - Commands and control functions
      - Policies and procedures

802.19.1 SDD Requirements

- Each CDS
  - Has a globally accessible URL and service port
  - Supports defined dialogs under the SSH and/or TLS protocols (R8)
  - All required information for coexistence shall be openly accessible
    - As per policies to be defined within 802.19
    - To 802.19.1 clients that comply with recommended behaviors
  - Is able to and shall exchange information for TVWS coexistence
  - Enables discovery by publishing its public URL with all known peer devices in a limited geographical area (R1)
  - Publishes all known peer CDS public URLs
  - These public URLs shall be in a text format specifying latitude, longitude and coverage to allow for traffic-free filtering

802.19.1 SDD Requirement

- The CDS'
  - Analyze the available information (R5)
  - Provide CE's with information (R4)
  - Recommends actions devices may take to improve coexistence (R6)
  - Becomes aware of the device compliance to the recommended actions
  - Disseminates recommended actions to optimize coexistence (R4)
- Recommended actions take the form of requests/commands (R4)
  - To reconfigure some device operating parameters
  - To fetch or push control information to 802.19 compliant TVBD devices
  - To implement TVWS coexistence decisions

Intended Scope

- It is the current intent to limit the scope of std version1 (R9)
  - To center frequency changes causing respectful spectrum etiquette
  - Only assigning co-channel operation (when required) to similar systems
  - Advising operators a situation has arisen when this is not possible