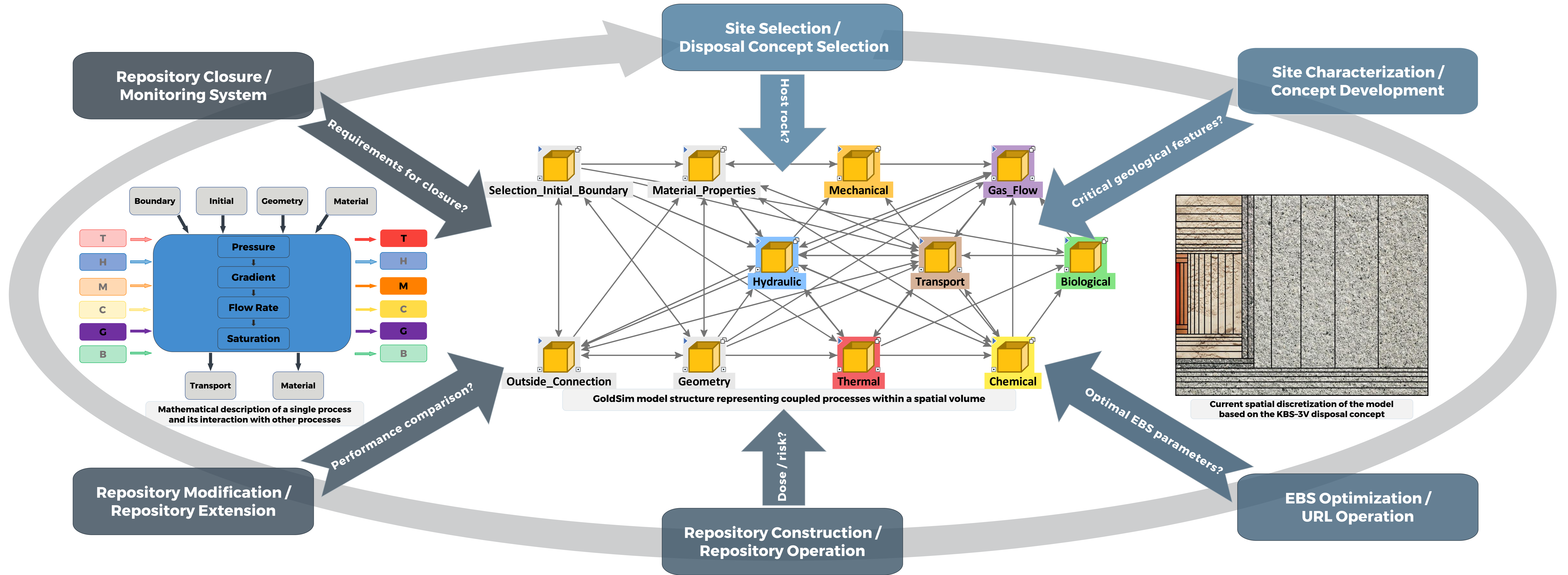


# Novel Coupled Modelling Approach for Total System Performance Assessment in GoldSim

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- Whole disposal system is considered
- Single model - **no need for external, specialized software tools**
- Different parts of the system directly interact
- Radionuclide release & transport - dose / risk calculation
- Hybrid modelling - disruptive events on top of continuous processes
- Developed for SNF / HLW but **adaptable** to geological disposal of LILW
- Currently implemented as a generic model for SKB's KBS-3V disposal concept

**Total System Performance Assessment**

- Focus on **Near-Field coupled processes**
- Selectable which processes are considered, and which are coupled
- Supports all processes to be coupled and RN transport to be calculated
- Material properties are dependent on state variables
- Physical & chemical processes are calculated based on material properties
- **Monte Carlo simulation** implemented in GoldSim to carry out probabilistic PA
- Easy to carry out uncertainty analysis, deterministic and stochastic sensitivity analysis

**THMCGB Coupled Modelling**

- Generic modelling structure adaptable to using site-specific data
- Support for **top-down modelling approach** - continuity over phases
- Adaptable to current phase's requirements - flexible inner structure
- Variables derived from human readable site characteristics & design info
- Database contains initial values, boundary conditions & material properties
- QA/QC can be implemented in the database
- Provides **tools for optimization**
- Easy to define, carry out & compare alternative scenarios & calculation cases

**Support for Waste Disposal Programs**

- Spatial discretization - spatial volumes with the same internal logic and structure
- Spatial volumes represent small parts - no need for thousands of elements
- **Considering heterogeneities** - different initial values, material properties
- Extensive usage of localized containers and cloning of elements
- Similar connections among neighboring volumes - flows and fluxes
- Mathematical models are easily adaptable to **site-specific requirements**

**FEM-like Modelling Approach**

- Decay heat generation, heat conduction and convection
- **Variably saturated two-phase Darcy-flow**, relative permeability
- Swelling pressure build-up in bentonite buffer
- Partitioning, dissolution and precipitation, RN and chemical transport
- Microbiological activity
- **Hybrid equilibrium-kinetic chemical model**, corrosion, backfill degradation
- Further processes (e.g. geomechanical stress & strain) to be implemented
- Benchmarking, detailed validation against measured data to be carried out

**Physical, Chemical, Transport Processes**