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Roadmap towards Ultimately-Efficient Datacenters

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Chip microscale liquid-cooling reduces thermal resistance and improves datacenter efficiency with higher coolant temperatures by eliminating chillers and allowing thermal energy re-use in cold climates. This concept has been successfully demonstrated three years ago in a one rack prototype and scaled up to a 10'000 server system. Liquid cooling enables an unprecedented density in future computers to a level similar to a human brain. This is mediated by a dense 3D architecture for interconnects, fluid cooling, and power delivery of energetic chemical compounds transported in the same fluid. Vertical integration improves memory proximity and electrochemical power delivery creating valuable space for communication. This strongly improves large system efficiency thereby allowing computers to grow beyond exa-scale.

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