



# Decentralized Interleaving of Parallel-connected Converters in DC Microgrids

**IP Status:** Issued US Patent; **Application #:** 15/973,161

## First fully decentralized strategy for switch interleaving of parallel converters

A decentralized control architecture allows parallel-connected converters to achieve an interleaved state. The controllers monitor slight changes in local current to construct the pulse width modulation (PWM) carrier and adjust their response accordingly. The intrinsic electrical coupling between converters allows the converters to converge to an interleaved state with uniform phase-spacing across carriers without communication.

## Leverages dynamics of nonlinear Liénard-type oscillators

Multi-phase power delivery architectures traditionally rely on a centralized controller to manage the pulse width modulation of the system to achieve minimal distortion. Because they rely on central logic, these systems are vulnerable to disruption. Furthermore, they are designed for a fixed number of converters, making them unsuitable for emerging applications such as DC microgrids that require plug-and-play functionality. This new approach results in more resilient systems since they do not have a single point of failure, and these systems can scale more rapidly as additional converters are added.

## Phase of Development

- Proof of concept. Simulations completed.

## Benefits

- Increased resiliency
- Rapidly scalable and customizable
- Consistently high load bus power quality

## Features

- Fully decentralized strategy for switch interleaving of parallel converters
- Liénard-type nonlinear oscillators

## Applications

- DC microgrids
- Data centers
- Telecommunications
- Power electronics; modeling, simulation and optimization of power electronics circuits
- Smart AC-DC systems, future grids

## "Researchers

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## Technology ID

20180089

## Category

Engineering & Physical  
Sciences/Instrumentation,  
Sensors & Controls  
Software & IT/Algorithms

## Learn more



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## **Publications**

[Decentralized Interleaving of Parallel-connected Buck Converters](#)

*IEEE Transactions on Power Electronics*, 04 September 2018

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