WORST−CASE INTERFERENCE IN DSL SYSTEMS EMPLOYING DYNAMIC SPECTRUM MANAGEMENT (ThuAmOR2)

Author(s) :

Mark H. Brady (Stanford University, United States)
John M. Cioffi (Stanford University, United States)

Abstract :

Dynamic Spectrum Management (DSM) has been proposed to achieve next−generation rates on digital subscriber lines (DSL). Because the copper twisted−pair plant is an interference−constrained environment, the multiuser performance and spectral compatibility of DSM schemes are of primary concern. While the analysis of multiuser interference has been standardized for current static spectrum management (SSM) techniques, at present no corresponding standard DSM analysis has been established. This paper examines a multiuser spectrum−allocation problem and formulates a lower bound to the achievable rate of a DSL modem that is tight in the presence of the worst−case interference. A game−theoretic analysis shows that the rate−maximizing strategy under the worst−case interference (WCI) in the DSM setting corresponds to a Nash equilibrium in pure strategies of a certain strictly competitive game. A Nash equilibrium is shown to exist under very mild conditions, and the rate−adaptive waterfilling algorithm is demonstrated to give the optimal strategy in response to the WCI under a frequency−division (FDM) condition. Numerical results are presented for two important scenarios: an upstream VDSL deployment exhibiting the near−far effect, and an ADSL RT deployment with long CO lines.
[continued on the next page]

WORST−CASE INTERFERENCE IN DSL SYSTEMS EMPLOYING DYNAMIC SPECTRUM MANAGEMENT (ThuAmOR2)

* Author(s) :	Mark H. Brady	(Stanford University, United States)
	John M. Cioffi	(Stanford University, United States)

* Abstract : (cont.)	The WCI rate bound shows that the performance improvement of DSM over SSM techniques can be preserved by appropriate distributed power control, even in worst−case interference environments. **[continued on the next page]**

WORST−CASE INTERFERENCE IN DSL SYSTEMS EMPLOYING DYNAMIC SPECTRUM MANAGEMENT (ThuAmOR2)

Author(s) : Mark H. Brady (Stanford University, United States)
John M. Cioffi (Stanford University, United States)

Abstract :
(cont.)