# STOCHASTIC PDE LIMITS OF OF MANY SERVERS QUEUES

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ABSTRACT. In this talk we shall consider a many servers queueing system in which customers with i.i.d service times enter service in their order of arrival. Motivating examples of such systems are large call centers and computer networks but the results apply to other service systems with many servers and high arrival rates. The state of the system is represented by a process that describes the number of customers in the system and a measure valued process that keeps track of the ages (amount of time in service) of the customers in service. This two component process is a Markov process with dynamics that satisfy a stochastic evolution equation. In this talk I'll discuss a functional strong law of large numbers(a fluid limit), as the number of servers and the arrival rates go to infinity, and a functional central limit theorem (FCLT, a diffusion limit), for the above pair of processes. The diffusion limit process describing the total number of customers in the system (properly centered and scaled) obtained by the above FCLT is shown to be an Ito diffusion whose diffusion coefficient is insensitive to the service distribution and its drift is described by the limiting measure valued process and the hazard rate function of the service distribution. The corresponding limit of the measure valued process is a distribution valued diffusion and, applied to a family of test functions, it is characterized as the unique solution of a set of stochastic PDE's.