

2009 Paper 8 Question 15

Distributed Systems

(a) The Domain Name System (DNS) is a large, successful distributed system. Its principal service is to map keys (such as host names) to values.

(i) What are the major components of the DNS and how do they interact? [3 marks]

(ii) Why does DNS impose a limit on the key length? [2 marks]

(iii) Describe *three* aspects of the system that would need to be changed in order to support unlimited key length. [2 marks each]

(b) A distributed component-based event middleware supports role-based access control. When the system is started, principal A has role B and principals having role B may carry out action C .

At time T , according to its local clock, a component receives a message that means “principal A no longer has role B .” At time $T + 10\text{ms}$, this component receives a message that means “perform action C as principal A .”

(i) Based solely on this information, immediately after the second message is received, why can the component not determine whether A may carry out C ? [3 marks]

(ii) What data structures should be placed within the two messages described above so that the component can determine, in this situation, whether A may perform C ? What algorithms would need to be applied by the middleware to make these data structures useful? [6 marks]