

A Survey Paper on Evolution Data Optimized

Priyanka Sisodiya¹ Anjuman Ranavadiya² Shreya Patel³

¹Student ^{2,3}Assistance professor

^{1,2,3}Department of Computer Engineering

^{1,2,3}GMFE, Himmatnagar

Abstract— 1X Advanced is the natural evolution of CDMA2000 1X, the first and one of the most widely deployed 3G technologies. 1X Advanced builds upon proven 1X technology and adds advanced techniques such as BTS interference cancellation, radio link enhancements and others to provide an unprecedented increase in performance to support the rising data demand of users. This unprecedented voice capacity increase can be used to free up spectrum to offer EV-DO data services. This is an important tool, among others, available to operators to address the explosive growth in data demand. [10]

Key words: EV-DO data services, 1X technology, CDMA 1x evolution–data optimized

I. INTRODUCTION

As the first mass market mobile broadband technology, EV-DO blazed a trail for the rest of the industry. With its head start, EV-DO quickly became the most widely deployed wireless broadband standard in the world. As of August 2007, the EV-DO Release 0 networks of 77 operators served more than 65 million subscribers in 46 countries worldwide. EV-DO Rev. A, which was commercially deployed in 2006. As of September 2007, Rev. A was available on five continents, with nationwide footprints of Rev. A in the U.S., Japan and Korea. [5]

As broadband data applications continue to grow in popularity, the increase in data adoption necessitates the deployment of multiple carriers of Rev. A. Rev. B allows higher data rates by aggregating Rev. A carriers, allowing applications such as high-def video conferencing and streaming video. Rev. B improves the user experience for all applications available over Rev. A, and provides a cost-effective way to achieve high data rates while leveraging the installed base of EV-DO users. [5]

Evolution-data optimized (EV-DO) is next step for the code division multiple access (CDMA) networks moving towards 3G. EVDO promises data speeds up to 2.4 Mbps on the forward link and 153.6 kbps on the download link. Compare this with the shared 64 kbps, where a subscriber actually gets between 20–35 kbps over GPRS connectivity and the 140–150 kbps over EDGE networks. Even the offered speed of 300–400 kbps over EVDO is faster than any other wireless access technology. [9]

As most modern wireless communication techniques, the EVDO employs adaptive modulation/coding schemes in both forward and reverse channels, although they are implemented in different ways depending on the direction considered. In the forward channel, the choice of bit rate depends on the carrier-to-interference ratio (C/I) perceived by the access terminal (AT). The AT passes the instantaneous channel quality information to the access point (AP) through the bit field DRC (Data Rate Control) in the reverse link. including respective bit rates, packet lengths and minimum SINR (signal-to-interference + noise ratio). [1]

EV-DO networks may use queue management to stop accepting packets into the queue when the network is congested. When an EV-DO network receives incoming packets at a rate higher than EV-DO can forward, the packets are dropped in a regular discrete fashion rather than a continuous fashion as would be the case with a drop-tail queue. [6]

Congestion control in the reverse link is achieved by a reverse activity (RA) bit sent in the forward channel by the AP. This bit is code multiplexed with the power control (RPC) logical channel to form the medium access control (MAC) signal. The MAC information is then time multiplexed with the pilot signal and the actual information bits. [1]

EVDO Rev-A is the current version of EVDO available. EVDO Rev-0 was the original technology. Rev-A is faster than Rev-0. All of the currently available EVDO modems are Rev-A. 1xEV-DO Revision 0 (Rev. 0) increases the downlink maximum theoretical data rate to 2.4 Mbps, with an average data rate between 400 and 700 Kbps. The average uplink data rate is between 60 and 80 Kbps. 1xEV-DO Revision A (Rev. A) supports Quality of Service (QoS), converges IP services and VoIP, reduces latency, increases the maximum theoretical downlink speed to 3.1 Mbps (average 600–1400 Kbps), and boosts the maximum theoretical uplink speed to 1.8 Mbps (average 500–800 Kbps). The entire Verizon Wireless EV-DO data network is now Rev. A-enabled. [3]

EVDO standard uses Time Division Multiple Access (TDMA) in the forward link in order to increase the data rates. [4]

Video streaming and telephony services are the killer applications of 3G cellular networks. The DORa (EV-DO Revision A) was primarily developed and standardized with many improvements over DOR0 for VoIP implementation. Supporting the video telephony (VT) requires considerable improvements in DORa technology due to the variable high bit rate nature of video data as compared to the lower and constant bit rate of the voice data. As a consequence, next generation technologies DORb and DORc are being developed by 3GPP2 (third Generation Partnership Project 2) to support these popular state of the art video applications. DORb and DORc are intended to be backward compatible to DOR0 and DORa. DORa provides an uplink (downlink) peak rate of 1.8Mbps (3.1Mbps), a downlink sector capacity of 1.5Mbps, and an uplink capacity of 0.5Mbps (1.2Mbps) for a two-way receive diversity (four-way receive diversity), with 16 active users per sector on the same 1.25MHz spectrum as in DOR0. [2]

CDMA 1x evolution–data optimized (1x EV-DO) is defined in the TIA/EIA IS-856 and IS-835 standards. The security of 1x EV-DO offers authentication, integrity, and encryption capabilities. 1x EV-DO supports authentication of the access terminal (AT) to authorize access to the wireless network, as well as authentication of a subscription to authorize access to the Internet Protocol (IP) network.

The system also provides session security via re-authenticating the AT during a session to prevent 1x EV-DO session hijacking and to protect integrity of the user packets. This paper will outline security threats to the 1x EV-DO system, security algorithms, authentication and authorization procedures, and ciphering procedures. The 1x EV-DO security will be detailed here for key exchange, authentication, and encryption functions by supporting the following protocols: security protocol, key exchange protocol, authentication protocol, and encryption protocol.[7]

CPM control of traffic queuing. This approach implements separate hardware-based CPM queues that are allocated on a per-peer basis. This mechanism guarantees fair and non-blocking access to shared CPM resources across all peers. Hardware management filtering and per-peer queuing. This is a hardware filter on the CPM that applies to all the traffic going through the CPM. It can be used to drop or accept packets, as well as to allocate dedicated hardware queues for the traffic. Per-peer queuing allows users to allocate dedicated hardware queues for certain traffic destined for the CPUs, and to set the corresponding rate-limit for the queue. Dedicated management routing instance. For enhanced system security, the management Ethernet port on the SF/CPM has a completely independent routing instance named "management" that is distinct from all in-band routing instances. Any out-of-band traffic received on the management Ethernet port cannot be forwarded out of any in-band ports and vice versa. Filtering and Access Control Lists (ACLs). Each Alcatel-Lucent 7750 SR flexible fast-path complex can perform media access control and IP ACL security filtering at line rate (10 Gb/s) without performance degradation. Since the ACL filtering is implemented in hardware, the performance does not degrade as is typical in traditional router ACLs.[8]

II. CONCLUSION

1xEV-DO Revision A is designed to offer efficient support for both delay-sensitive and delay-tolerant applications. Salient features added to 1xEV-DO Revision A are short packets and multi-user packets on the downlink, and physical layer ARQ and multi-flow reverse link MAC layer on the uplink. The inclusion of these features provides substantial improvement in the performance of delay-sensitive applications such as VoIP, gaming, and video telephony. [11] The ability to support telco-quality VoIP, enhanced rich media applications and broadband data connectivity on the same network provides a competitive advantage over competing networks.[9] The EVDO help to provide faster data rate to CDMA.

REFERENCES

- [1] User Level Fairness of a Multirate 3G Technology (EVDO) With Application to Digital TV Return Channel Technology, Guilherme Dutra Gonzaga Jaime, Rosa M. M. Leão, Edmundo de Souza e Silva, and J. Roberto Boisson de Marca, IEEE TRANSACTIONS ON BROADCASTING, VOL. 54, NO.3, SEPTEMBER 2008
- [2] Video Telephony Performance over Cellular CDMA EVDO Rev. A, Kashyap K. R. Kambhatla

Computational Science, San Diego State University, San Diego, CA, kkambhat@sciences.sdsu.edu, Sunil Kumar Electrical and Computer Engineering, San Diego State University, San Diego, CA, skumar@sdsu.edu. Claudio R. Lima Next Generation Technology Group, Sprint Advanced Technology Labs, Burlingame, CA, Claudio.Lima@sprint.com

- [3] Verizon Wireless White Paper, CDMA Network Security
- [4] Scheduler design for traffic classification in CDMA2000 1xEVDO Network Volkan Sevindik • Oguz Bayat • Jay Weitzen Published online: 18 September 2011 Springer Science+Business Media, LLC 2011
- [5] <https://www.qualcomm.com/media/documents/files/ev-do-rev-a-and-b-wireless-broadband-for-the-masses-whitepaper.pdf>
- [6] Characterization of a 3G EV-DO Network - a Measurement Study, Zhe Zhou, Mark Claypool and Robert Kinicki, Computer Science Department at Worcester Polytechnic Institute, Worcester, MA USA, {jeffz,claypool,rek}@cs.wpi.edu.
- [7] A UNIFIED COMPARISON OF CDMA EVDO KEY PERFORMANCE PARAMETERS IN MULTI-VENDOR ENVIRONMENT, Rabnawaz Anwar¹ and Irfan Ahmed², Institute of Communications Technologies (ICT-PTCL) NWFP University of Engineering and Technology Peshawar, Pakistan, College of Computers and Information Technology Taif University, P.O. Box 888 Taif, Saudi Arabia, International Journal of Distributed and Parallel Systems (IJDPS) Vol.3, No.4, July 2012.
- [8] Optimizing CDMA and EV-DO Backhaul Architectures with Alcatel-Lucent 7750 Service Routers pdf
- [9] [http://ids.nic.in/technical_letter/Tnl_Jan2014/EVD0%20\(volution,%20Data%20Optimized\)%20Technology.pdf](http://ids.nic.in/technical_letter/Tnl_Jan2014/EVD0%20(volution,%20Data%20Optimized)%20Technology.pdf)
- [10] <https://www.qualcomm.com/media/documents/files/wireless-networks-1x-advanced-four-fold-increase-in-voice-capacity.pdf>
- [11] IEEE Communications Magazine • February 2006