Message Authentication in VANET

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INTRODUCTION

- The Multidimensional Knapsack Problem (MKP) is a NP-hard problem which has many practical applications, such as processor allocation in distributed systems, cargo loading, or capital budgeting. The goal of the MKP is to find a subset of objects that maximizes the total profit while satisfying some resource constraints.

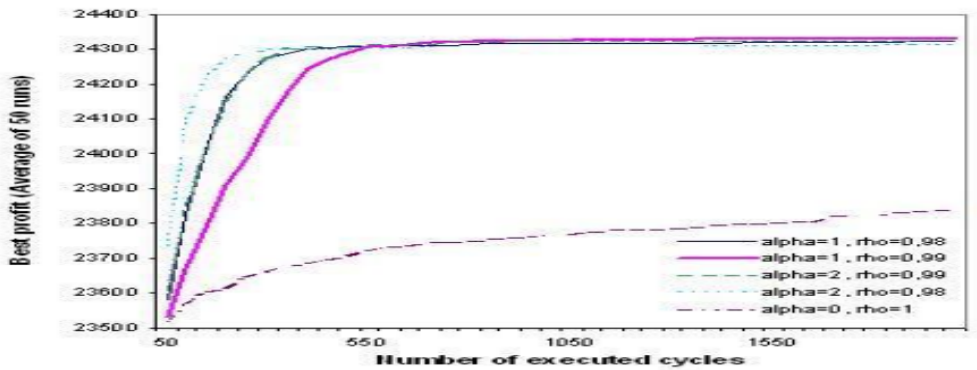

Figure: Influence of and on solution quality: each curve plots the evolution of the profit of the best solution when the number of cycles increases, for a given setting of and . The other parameters have been set to = 5, nbAnts = 30, min = 0.01, and max = 6.

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- VANET is self-organised network , used for communicating between vehicles

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- Hybrid vehicular network communication

Vehicular Ad-hoc Network(VANET)

- Network infrastructure: Vehicles connect to a centralized server or a backbone network such as the Internet, through the road-side infrastructure, e.g., cellular base stations, IEEE 802.11p RSUs

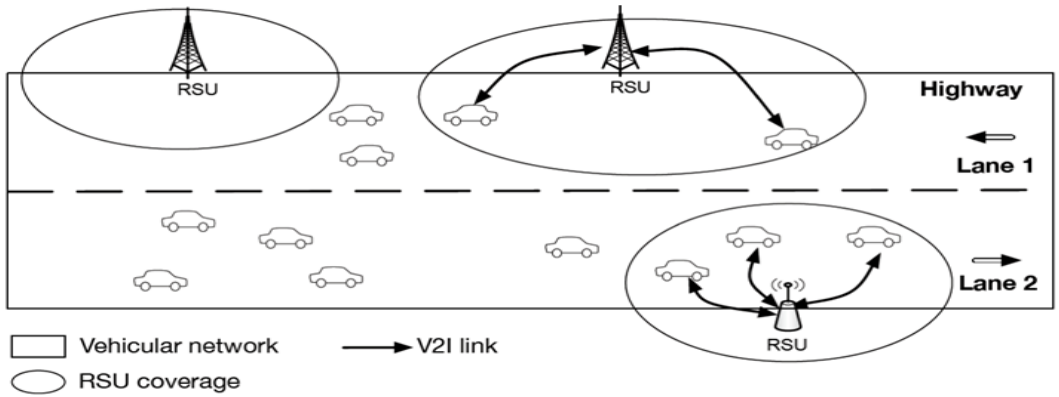


Figure: Network infrastruture traffic model

Vehicular Ad-hoc Network(VANET)

- Inter-vehicular communication:Use of direct ad-hoc connectivity among vehicles via multihop for applications requiring long-range communications (e.g., traffic monitoring), as well as short-range communications (e.g., lane merging)

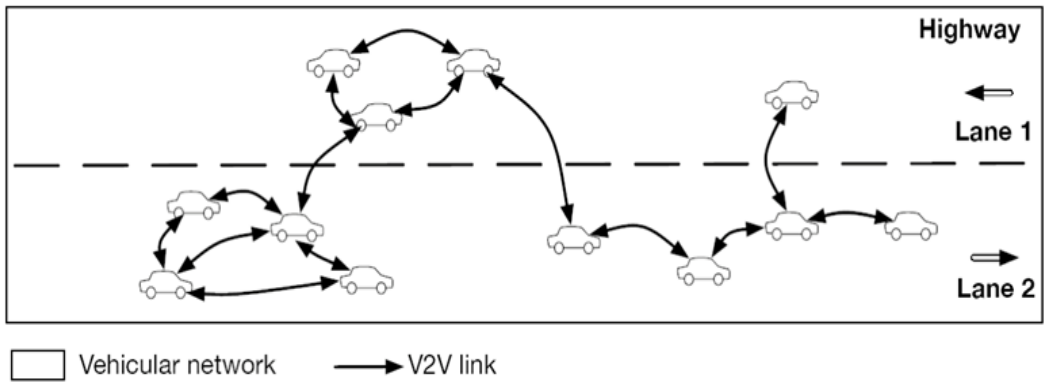
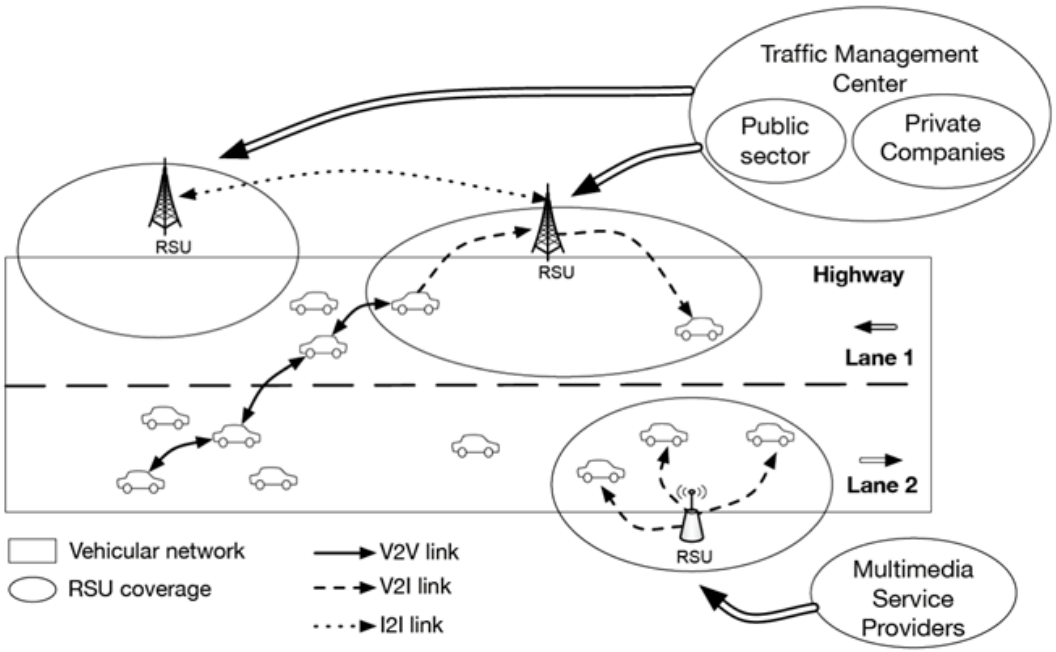


Figure: Inter-vehicular traffic model

Vehicular Ad-hoc Network(VANET)

- Hybrid vehicular network communication:Use of a combination of V2V and V2I. Vehicles in range directly connect to the road-side infrastructure, while exploit multi-hop connectivity otherwise



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- Cooperative Driving: Drivers can get signals for traffic related warnings like curve speed warning, Lane change warning etc. These signals can co-operate the driver for an uninterrupted and safe driving
- Traffic optimisation: Traffic can optimised by the use of sending signals like jam, accidents etc. to the vehicles so that they can choose their alternate path and can save time

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- Other services: VANET can be utilised in other user based application such as payment service to collect the toll taxes, to locate the fuel station, restaurant etc.

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- Message suppression attack:Attacker drops message from the network,which have critical information to the receiver
- Fabrication attack: Attacker transmits false information in to the network

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- Sybil attack: This attack happens when an attacker creates large number of pseudonymous, e.g.: jam ahead and force them to take alternate route.

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- Time Critical: The information in VANET must be delivered to the vehicle with in time limit so that a decision can be made by the vehicle and perform action accordingly.

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- Data Verification: A regular verification of data is required to eliminate the false messaging.

Message Authentication in VANET

ECDSA Approach

- Reasons for ECDSA used in VANET

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	Key	Private	Public	Sign [s]	Verify [s]
RSA	512	73148	789777	0.000137	0.000013
RSA	1024	13272	254362	0.000747	0.000039
RSA	2048	2045	64246	0.004873	0.000155
RSA	4096	268	17040	0.037068	0.000574
DSA	512	74480	68644	0.000134	0.000145
DSA	1024	24869	21805	0.000401	0.000459
DSA	2048	6469	5545	0.001533	0.001802
ECDSA	160	92305	24595	0.0001	0.0004
ECDSA	192	73776	18892	0.0001	0.0005
ECDSA	224	57669	14097	0.0002	0.0007
ECDSA	256	47598	10836	0.0002	0.0009
ECDSA	384	22111	4551	0.0005	0.0022
ECDSA	521	11311	2122	0.0009	0.0047

Figure: comparison of rsa,dsa and ecdsa

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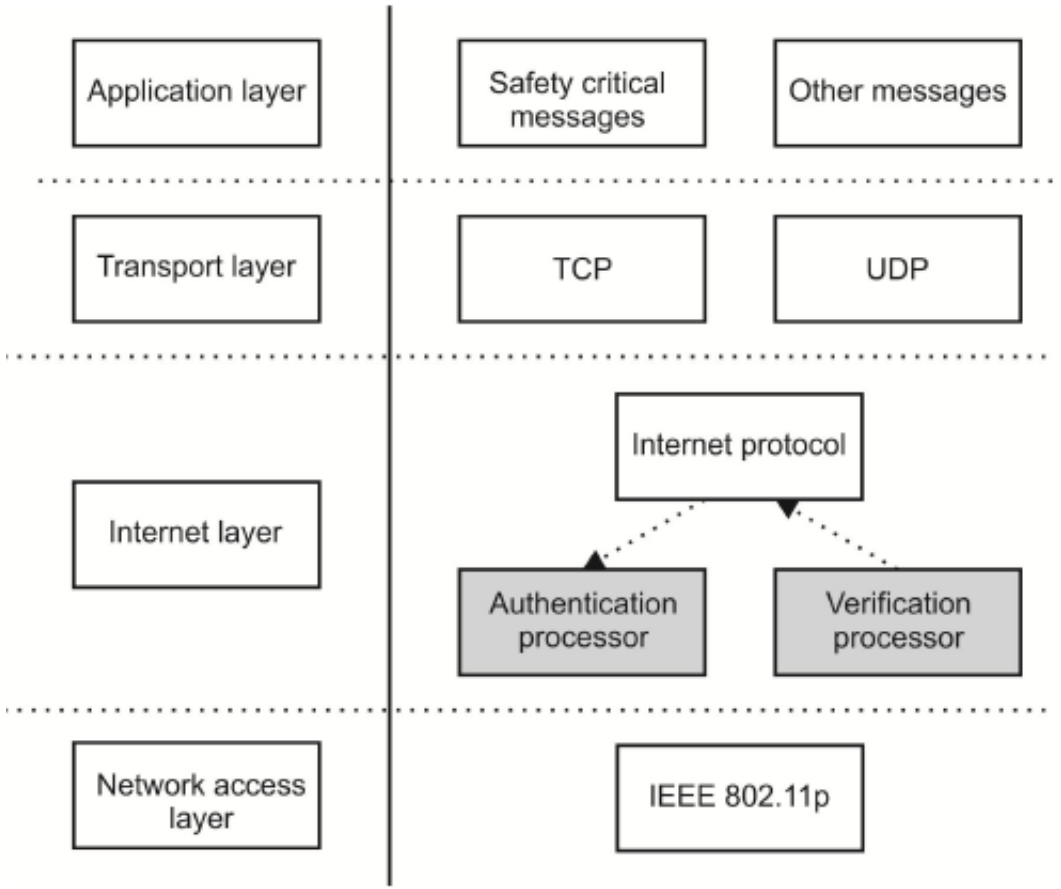
ECDSA Approach

- Two types of messages
  safety critical messages
  event driven messages



- shared secret key
- Signature Generation
- Signature Verification

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- $S_k = (X_s, Y_s)$

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- the signature pair (r, s)

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- the signature is valid if $x_1 = r(mod n)$, otherwise invalid

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- update the table
- check for the new vehicle in the coverage area

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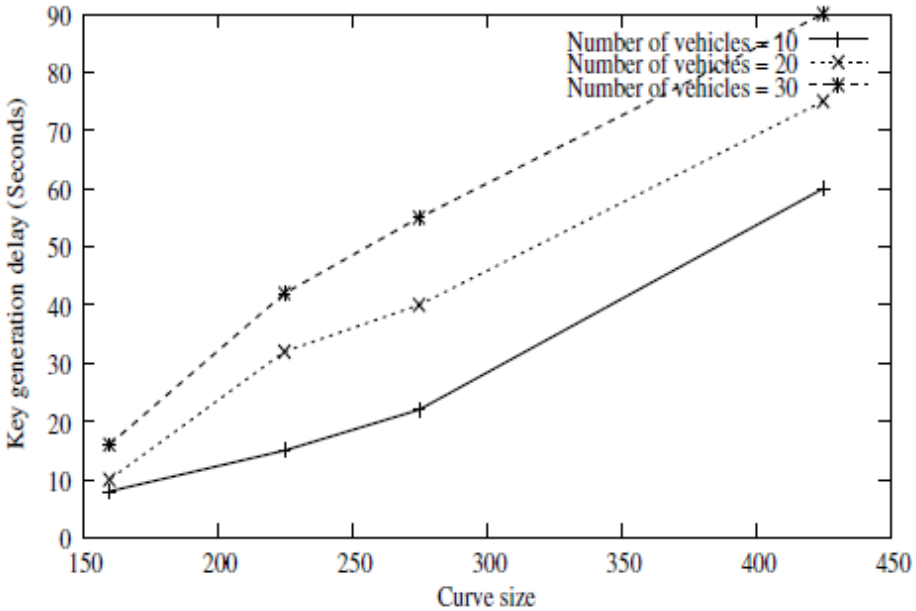

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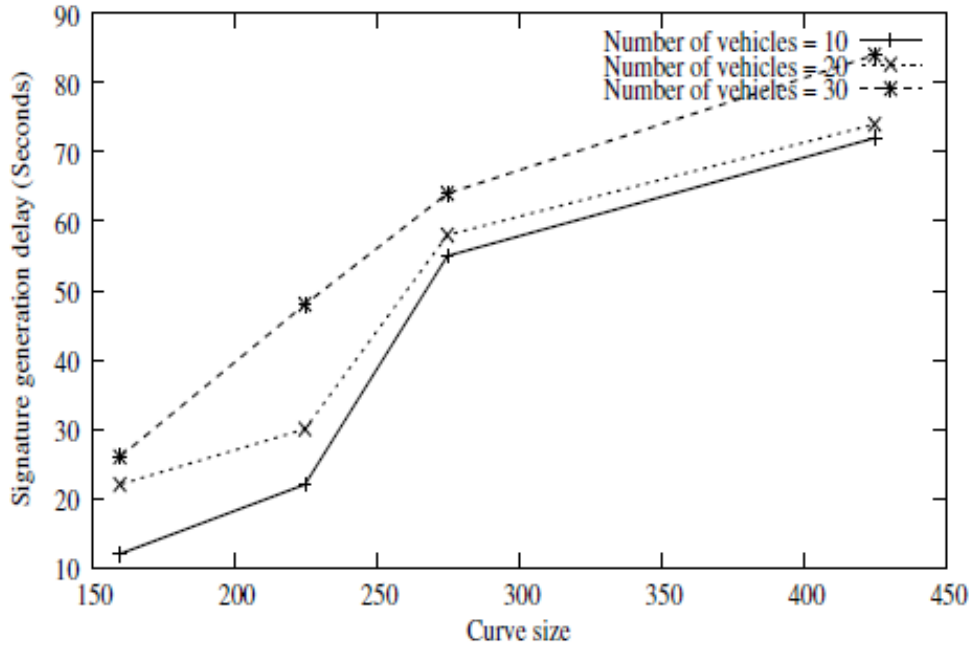

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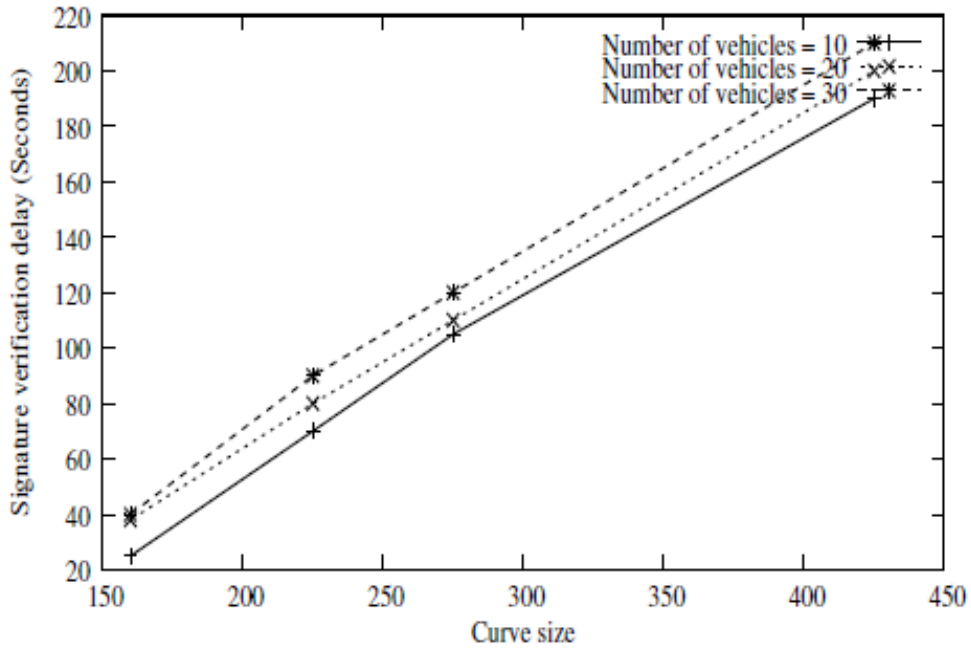

Figure: signature verification delay vs curve size

Conclusion

- Security is the major issue to implement in the VANET.
- As the number of vehicles increases the message delay increase to reduce the delay we need add more number of infrastructure unit

Reference I


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