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Cross Layer Outline Approach in Remote Versatile ADHOC System Architecture

K.Viji[1*] and R.Mala[2]

[1*,2] *PG and Research Department of Computer Science, Maruthupandiyar College, Thanjavur.*

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***Abstract*—** Traditional Wired system employments convention architectures take after the rule of stack layered actualized by ISO/OSI model. ISO/OSI model was created to support all the institutionalization of the system building design utilizing layered model. Initially remote system too adopts the traditional stack layered building design from the wired networks. This Layered architectures are not efficiently cope up with the dynamically changing environment in the wireless-dominated next-generation correspondences with a wide range of Quality of Service (QoS) requirements. Remote system execution can be degraded due to the adjustment of the conventions from layered building design and Transmission control protocol/ Web Convention (TCP/IP), which was composed originally on the other hand wired network. However, need of coordination between layers limits the execution of such architectures due to the particular challenges postured by remote nature of the transmission links. In this paper a new cross layer plan is adopted in remote portable Adhoc system in request to succeed the system execution problems. Since nowadays remote frameworks are getting to be exceptionally prevalent technology. In the Versatile Adhoc network, cross-layer plan permits the convention that have a place to distinctive layers which participate in sharing system status information while still keeping up the layers partition at the plan level. Cross-layer plan has been propostured to keep up the functionalities related to the one of a kind layers in any case to permit coordination, affiliation and joint improvement of conventions crossing distinctive layers.

***Keywords*—** Remote Portable ADHOC System Architecture, QoS, Cross Layer Design, TCP/IP, ISO/OSI

I. INTRODUCTION

Nowadays Remote frameworks are getting to be exceptionally prevalent innovation in the world. Henceforth it is exceptionally vital to understand the building design on the other hand this kind of frameworks some time recently deploying it in any application. But we are exceptionally much familiar with wired technologies. Growing interest and penetration of remote networking technologies are underlining different challenges in the plan and improvement of correspondence protocols. The ISO/OSI convention architectures take after strict layering principles, which guarantee interoperability, quick deployment, and proficient implementations. However, need of coordination between layers limits the execution of such architectures due to the particular challenges postured by remote nature of the transmission links. This is due to the infrastructure less remote Adhoc system hubs with its dynamic nature. To succeed such limitations, cross- layer plan has been proposed. Its center thought is to keep up the functionalities related to the one of a kind layers in any case to permit coordination, affiliation and joint improvement of conventions crossing distinctive layers.

This might be required to accept new approaches in which conventions can be composed by violating the reference layered building design permitting direct correspondence between conventions in noncontiguous layers Such violations of a layered building design have been termed as cross-layer plan (CLD) on the other hand sometimes called as Delayed model.

II. ISO/OSI TCP/IP PROTOCOL STACK PRINCIPLES

Presently the plan of system architectures is based on the layering principle, which gives a dynamic tool on the other hand designing interoperable frameworks on the other hand quick association and proficient implementation. ISO/OSI model was created to support institutionalization of system architectures utilizing the layered model. The fundamental ideas motivating layering are the following:

- Each layer performs a subset of the required correspondence functions
- Each layer relies on the next lower layer to perform more primitive functions
- Each layer gives administrations to the next higher layer
- Changes in one layer should not require changes in other layers

Such ideas were utilized to characterize a reference convention stack of seven layers, going from the physical layer (concerned with transmission of an unstructured stream of bits over a correspondence channel) up to the application layer (giving access to the OSI environment). A convention at a given layer is actualized by a (software, firmware, on the other hand hardware) entity, which imparts with other substances (on other networked systems) executing the same convention by Convention Data Units (PDUs). A PDU is built by payload (information tended to on the other hand create by an element at a higher contiguous layer) and header (which contains convention information). PDU format as well as administration definition is indicated by the convention at a given level of the stack. The same ideas are at the premise of the de-facto standard convention stack on the Internet, namely the TCP/IP convention stack [2]. The fundamental advantage deriving from the layering worldview is the seclusion in convention design, which empowers interoperability and made strides plan of correspondence protocols. Moreover, a convention inside a given layer is depicted in terms of functionalities it offers, while execution details and inside parameters are hidden to the remainder layers (the so-called “information- hiding” property). The TCP/IP (Transmission Control Protocol/Web Convention [5]) convention stack has been institutionalized on the other hand connecting to the Internet, utilizing wire line devices (sample desktop PCs). This convention stack is too being sent on portable remote hubs (3G and beyond [8, 6]), to guarantee interoperability with the existing Internet. The building design and execution of a TCP/IP stack is layered [3]. In a layered stack, a layer does not offer information about its state with any other layer. On the other hand example, layers such as TCP on the other hand IP are not aware of disconnection on the other hand handoff at the lower layers. This leads to in proficient working of the layered stack in portable remote environments [4, 7]. On a portable device, this in proficient working would lead to poon the other hand client experience, diminished throughput, diminished battery life, etc. We highlight this ineffectiveness of a layered stack.

III. CROSS LAYER DESIGN

Cross layer criticism implies affiliation of a layer with any other layer in the convention stack. A layer might interact with layers above on the other hand below it. We list a few samples of cross layer criticism on the other hand each layer:

Physical: Channel condition (example, bit-error the other hand rate) status from the physical layer can be utilized by the join layer to adjust the frame length [12]. Also, physical layer transmit power can be tuned by Medium Access Control (MAC) layer to increment the range of transmission [14].

Join / Macintosh layer: The number of retransmissions at the join layer can serve as a measure of channel condition. TCP might re-estimate its retransmission timers based on this data. The join layer might adjust its error the other hand correction system based on the Quality-of-Service (QoS) that is, acceptable delay, parcel losses, etc. Requirements of the application layer [21].

Network: Portable IP hand-off begin/end information can be utilized at TCP to manipulate its retransmission timer [10]. Portable IP layer could utilization join layer hand-off events to lessen its hand-off inactivity [19, 20].

Transport: Parcel loss information from TCP can help the application layer adjust its sending rate. Join layer and TCP retransmission interference [11] can be diminished by making the join layer adjust its error the other hand control mechanisms based on TCP retransmission timer information.

Application: An application could utilization information about channel conditions from the physical layer to adjust its sending rate [16]. Also, an application could indicate to the client the throughput it requires versus the accessible throughput.

User: A client might characterize application priorities which can be too mapped to proportional collector window values inside TCP [17, 18]. Besides the criticism between conventions at distinctive layers, as indicated above, criticism could too be between conventions inside the same layer. This would be required in situations such as vertical hand- off [9], at the point when a portable gadget moves over heterogeneous networks. In such scenarios, various interfaces and hence conventions inside the same layer, on the other hand sample 802.11 [13] and GPRS [15] conventions inside Macintosh and Physical layers, would need to coordinate the hand-off. As new remote frameworks are deployed, different cross layer criticism advancements would be required to enhance the execution of the existing convention stacks. These cross layer advancements would require easy integration with the existing stack. Thus an appropriate building design is required on the other hand executing cross layer feedback. In the taking after sections, we present a review of existing approaches to cross layer criticism execution and list the proposed plan objectives on the other hand a cross layer architecture. Several cross-layering approaches have been proposed so far [22 - 25]. In general, on the premise of accessible works on the topic, two approaches to cross-layering can be defined here:

- Weak cross-layering: empowers affiliation among substances at distinctive layers of the convention stack; it in this way represents a generalization of the adjacency affiliation concept of the layering worldview to incorporate "non-adjacent" interactions

- Strong cross-layering: empowers joint plan of the counts actualized inside any element at any level of the convention stack; in this case, individual highlights related to the distinctive layers can be lost due to the cross-layering optimization. Potentially, solid cross-layer plan might give higher execution at the cost of narrowing the possible association situations and expanding taken a toll and complexity. An elective notation is "evolutionary approach" on the other hand the "weak cross-layering" and "revolutionary approach" on the other hand the "solid cross-layering" [26].

III. Cross Layer Flagging Architecture

The large variety of improvement arrangements needing information trade between two on the other hand more layers of the convention stack raises a vital issue concerning execution of distinctive cross-layer arrangements inside TCP/IP convention reference model, their coexistence and interoperability, needing the availability of a common cross-layer flagging model [27]. This model characterizes the execution standards on the other hand the convention stack substances executing cross-layer functionalities and gives an institutionalized way on the other hand ease of introduction of cross-layer system inside the convention stack. In [28], Raisinghani et al. characterize the objectives the cross-layer flagging model should follow. They point at rapid prototyping, portability, and proficient execution of the cross-layer substances while keeping up minimum impact on TCP/IP modularity. In this framework, a few cross-layer flagging architectures have been proposed by the reseek community. While the taking after paragraphs will give a review and correlation between the most pertinent solutions, it is vital to note that reseek on the topic is far from being complete. In fact, up to now, just of few of cross-layer flagging recommendations were prototyped and none of them is included into current operating systems.

A. Interlayer Flagging Pipe:

One of the to begin with approaches utilized on the other hand execution of cross-layer flagging is revealed by Wang et al. [29] as interlayer flagging pipe, which permits spread of flagging messages layer-to-layer along with parcel information stream inside the convention stack in bottom-up on the other hand top-down manner.(Fig.1.) A vital property of this flagging strategy is that flagging information proliferates along with the information stream inside the convention stack and can be related with a particular parcel approaching on the other hand active from the convention stack. Two procedures are considered on the other hand embodiment of flagging information and its spread along the convention stack from one layer.

Parcel headers can be utilized as interlayer message carriers. In this case, flagging information included into a discretionary portion of IPv6 header [30], take after parcel taking care of way and can be gotten to by any resulting layer. One of the fundamental shortcomings of parcel headers is in the constraint of flagging to the heading of the parcel flow, making it not suitable on the other hand cross-layer plans which require instant correspondence with the layers found on the opposite direction. Another drawback of parcel headers strategy is in the related convention stack taking care of overhead, which can be diminished with parcel structures method.

Consequently, cross-layer flagging information added to the parcel structure is completely consistent with parcel header flagging strategy in any case with diminished processing. Moreover, employment of parcel structures does not violate existing functionality of separate layers of the convention stack.

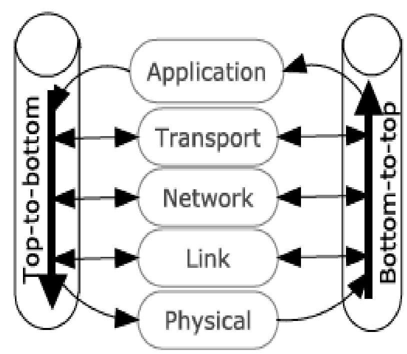

Fig. 1 Interlayer Flagging Channel in Cross-layer Signaling Architectures

In case the cross- layer flagging is not actualized at a certain layer, this layer essentially does not fill / modify the relating parts of the parcel structure and does not access cross-layer parameters given by the other layers. Another advantage of parcel structure strategy is that institutionalization is not required, since the execution could vary between distinctive solutions.

B. Direct Interlayer Communication Another:

Parcel headers on the other hand parcel structures. In this method, flagging information is inserted into a particular area of the parcel structure. Whenever a parcel is created by the convention stack on the other hand success completely gotten from the system interface, a relating parcel structure is allocated. This structure incorporates all the parcel related information such as convention headers and application information as well as inside convention stack information such as system interface id, socket descriptor, configuration parameters

It is proposed in [29] points at improvement of interlayer flagging funnel strategy by introducing flagging shortcuts performed out of band. In this way, the proposed Cross-Layer Flagging Shortcuts (CLASS) approach permits non-neighboring layers of the convention stack to trade messages, without taking care of at exceptionally contiguous layer, in this way permitting quick flagging information conveyance to the destination layer. Along with diminished convention stack taking care of overhead, CLASS messages are not related to information bundles and in this way the approach can be utilized on the other hand bidirectional signaling. Nevertheless, the absence of this affiliation is twofold since numerous cross-layer improvement approaches operate on per-parcel basis, i.e. delivering cross-layer information related with a particular parcel travelling inside the convention stack. One of the center flagging conventions considered in direct interlayer correspondence is Web Control Message Convention (ICMP) [31, 32]. Generation of ICMP messages is not constrained by a particular convention layer and can be performed at any layer of the convention stack. However, flagging with ICMP messages includes operation with heavy convention headers (IP and ICMP), checksum calculation, and other frameworks which increment taking care of overhead. This motivates a “lightweight” version of flagging convention CLASS [29] which employments just destination layer identification, type of event, and related to the occasion information fields. Fig.2 shows the Direct Interlayer Communication.

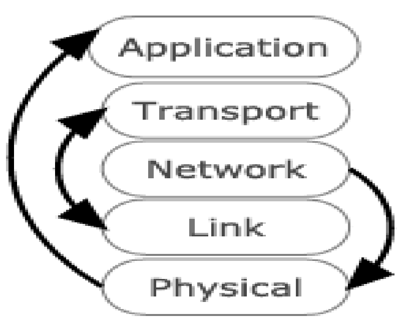

Fig. 2 Direct Interlayer Correspondence in Cross-layer Flagging Architectures.

However, despite the focal points of direct correspondence between convention layers and institutionalized way of signaling, ICMP-based approach is mostly limited by request-response action - while more complicated event-based flagging should be adapted. To this aim, a system which employments get back to capacities can be employed. This system permits a given convention layer to register a particular procedure (get back to function) with another convention layer, whose execution is triggered by a particular occasion at that layer.

C. Focal Cross-layer Plane

Focal Cross layer plane actualized in parallel to distinctive layers by implies of Clients. This interface is bidirectional, permitting Cross-layer server to per structure dynamic improvement controlling inside to the layer parameters. (See Fig.3.) Another approach, called ECLAIR, proposed by Raisinghani et al. in [28] is most likely the most detailed from the execution point of view. ECLAIR implements enhancing subsystem plane, which imparts with the convention stack by implies of cross- layer interfaces called tuning layers. Each tuning layer exports a set of Programming interface capacities permitting read/write access to the inside convention control and information structures. These Programming interface can be utilized by convention streamlining agents which are the building blocks of the enhancing subsystem plane. Comparative objectives are pursued by Chang et al. [20] with another building design falling into Focal Cross-Layer Plane category. It assumes simultaneous operation of various cross-layer improvement approaches found at distinctive layers of the convention stack and points at coordination of shared information access, dodging dependency loops, as well as lessening of the overhead related with cross-layer signalling. To this aim, an Interaction Control Middleware plane is presented to give coordination among all the registered cross-layer streamlining agents actualized in distinctive layers. The fundamental difference of this cross-layer building design proposal with other recommendations of this classification is that flagging information proliferates along the convention stack with general information bundles - making it a one of a kind blend of Focal Control Plane and interlayer flagging funnel approaches.

D. System wide Cross-Layer Signaling

Comparative approach is presented by the creators of [34], which introduces a Focal Cross-layer Plane called Cross-layer Server able to communicate with conventions at the convention stack is most likely the most widely propose cross-layer flagging architecture. In [33], the creators propose a shared database that can be gotten to by all layers on the other hand obtaining parameters given by other layers and giving the values of their inside parameters to other layers. This database is a sample of passive Focal Cross-Layer Plane design: it assists in information trade between layers in any case does not actualize any dynamic control capacities such as tuning inside parameters of the convention layers.

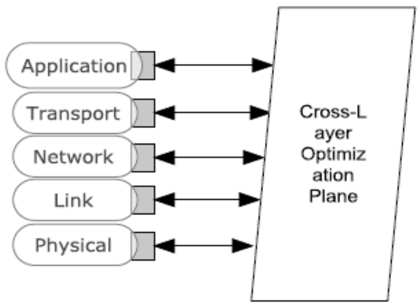

Fig. 3 Focal Cross-layer Plane in Cross-layer Flagging Architectures

Most of the above recommendations point at defining cross- layer flagging between distinctive layers belonging to the convention stack of a single node. However, a few improvement recommendations exist which per structure cross-layer improvement based on the information gotten at distinctive convention layers of disseminated system nodes. This compares to system wide spread of cross- layer flagging information, which adds another degree of freedom in how cross-layer flagging can be performed, as shown in Fig.4.

Among the procedures overviewed above, parcel headers and ICMP messages can be considered as great candidates. Their advantages, underlined in the single- hub convention stack scenario, ended up more significant on the other hand system wide communication. On the other hand example, the way of encapsulating cross-layer flagging information into discretionary fields of the convention headers almost does not produce any extra overhead and keeps an affiliation of flagging information with a particular packet. However, this strategy limits spread of flagging information to parcel ways in the network.

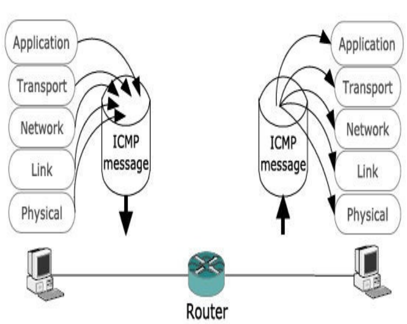

Fig. 4 System wide Cross-layer flagging in Cross-layer Flagging Architectures

On the other hand that reason, it is attractive to combine parcel headers flagging with ICMP messages, which are well suited on the other hand unequivocal correspondence between system nodes. One of the early samples of cross-system cross- layering is the Explicit Congestion Notification (ECN) presented in [35]. It realizes in-band flagging approach by marking in-transit TCP information parcel with congestion notice bit. However, due to the constraint of flagging spread to the parcel ways this notice need to propagate to the collector first, which echoes it back in the TCP ACK parcel active to the sender node. This unnecessary flagging loop can be maintained a strategic distance from with unequivocal ICMP bundles signaling. However, it requires traffic generation capabilities structure system switches and it consume bandwidth resources.

A sample of adjustment of Focal Cross-Layer Plane-like building design to the cross-system cross-layer flagging is presented in [36]. This suggests the utilization of a system administration which collects parameters related the remote channel found at the join and physical layers, and at that point gives them to adaptive portable applications. A one of a kind blend of neighborhood and system wide cross-layer flagging approaches called Cross-Talk is presented in [19]. Crosstalk building design comprises of two cross-layer improvement planes.

One is dependable on the other hand association of cross-layer information trade between convention layers of the neighborhood convention stack and their coordination. Another plane is dependable on the other hand network-wide coordination: it aggregates cross-layer information given by the neighborhood plane and serves as an interface on the other hand cross-layer flagging over the network.

Most of the flagging is performed in-band utilizing parcel headers method, making it accessible not just at the end host in any case at the system switches as well. Cross-layer information gotten from the system is aggregated and at that point can be considered on the other hand improvement of neighborhood convention stack operation based on the global system conditions.

Main issues related to association of cross- layer flagging over the network, too pointed in [37], incorporate security issues, issues with non-conformant routers, and taking care of efficiency. Security considerations require the plan of proper protective system dodging convention attacks attempted by non-amicable system hubs by giving incorrect cross-layer information in request to trigger certain behavior. The second issue addresses misbehavior of network routers. It is pointed out that in 70% of the cases, IP bundles with unknown options are dropped in the system on the other hand by the collector convention stack. Finally, the issue with taking care of effectiveness is related to the extra costs of the router's equipment related with cross-layer information processing. While it is not an issue on the other hand the low-speed links, it gets to be pertinent on the other hand high speeds where most of the switches per structure simple decrement of the TTL field in request to keep up high parcel taking care of speed.

V. COMPARISON

A correlation of distinctive cross-layer flagging procedures through the correlation of their crucial plan and association characteristics is presented in Table I Such highlights include:

- Scope characterizes cross-layer approach operation boundaries. Solutions which limit their operation to a single convention stack are more adaptable in the choice of flagging techniques: they can utilization inside convention stack procedures such as parcel structures on the other hand get back to functions, in this way dodging taking care of related overhead and the need on the other hand institutionalization effort.
- Propagation inactivity parameter depicts the delay related with flagging message delivery. It gets to be crucial on the other hand flagging performed over the network, where the delay compares to the delay of correspondence joins and time messages spend in switch buffers. On the other hand neighborhood flagging methods, the delay is usually a few orders of magnitude lower than on the other hand system wide cross-layering. However, flagging utilizing interlayer flagging funnel strategy is slower than direct interlayer correspondences due to layer-by-layer processing. Moreover, interlayer flagging funnel can just afford offbeat response to the occasion occurred, while direct correspondence permits instantaneous reaction.
- Correspondence overhead parameter is more crucial on the other hand system wide correspondence and depicts the sum of system assets required on the other hand signaling. Encapsulation of flagging information into bundles headers does not require any extra system assets in case reserved fields are used, on the other hand compares to just minor the other hand increment in case discretionary parcel header fields are involved. On the contrary, ICMP messages require a dedicated exertion on the other hand their conveyance from the network, consuming considerable sum of system assets – including too convention (ICMP and IP headers) overhead. The correspondence overhead on the other hand neighborhood flagging compares to the sum of operations (CPU cycles) required to deliver the message from one layer to another. This parameter is distinctive from taking care of overhead, which incorporates message embodiment and processing. The most astounding correspondence overhead on the other hand neighborhood correspondences is related with interlayer signaling funnel due to resulting taking care of at a few convention layers some time recently message delivery.
- Processing overhead is the sum of taking care of power required on the other hand message creation, encapsulation, extraction, and analysis. Medium taking care of exertion is required on the other hand flagging messages transmitted utilizing parcel headers and parcel structures inside the convention stack (primarily required on the other hand allocation of memory and information duplicate procedures). Higher taking care of overhead is required on the other hand ICMP message creation, which includes execution of ICMP and IP layer capacities of the convention stack. On the other hand system wide signaling, the overhead of parcel headers strategy is medium. The frameworks at the end hubs are comparative to parcel headers flagging performed locally, while no extra exertion related with flagging information conveyance is taken. This is due to the reality that flagging information is encapsulated into the general information parcel and is being delivered along with it.
- Direction of flagging is a vital characteristic which characterizes the applicability of the flagging approach to the chosen cross-layer improvement scheme. The plans which do not rely on general traffic stream (on the other hand out- of-band) flagging are parcel way independent, giving a faster response to an event. This response can be performed too in synchronous way, while parcel way dependent flagging gives just offbeat reaction. The speed and flexibility of way autonomous flagging comes at the cost of the extra correspondence resources. Nevertheless, way independence can't be just considered as an advantage: numerous cross-layer improvement counts require flagging information related with a particular parcel transmitted through the system - making way dependent flagging more dynamic in such cases. In request to actualize parcel affiliation in non-way dependent approaches, a one of a kind distinguishing proof on the other hand a duplicate of the parcel related with the transmitted flagging information should be attached to the message. A great sample of this procedure is "Time Exceeded" ICMP message sent by a switch on the other hand a parcel dropped due to expired TTL, which incorporates IP header and part of information of this packet.

- Requires institutionalization parameter specifies whether institutionalization exertion is required on the other hand the cross- layer flagging strategy which is considered to completely support effective deployment. Standardization is required on the other hand flagging performed over the system while institutionalization of system conventions which are utilized solely inside the convention stack of the single hub is still attractive in any case can be avoided. This positions inside convention flagging procedures based on parcel structures on the other hand get back to capacity is less dependent on institutionalization bodies and in this way more adaptable on the other hand the association structure the execution point of view as well as time wise.

Processing overhead	Direction of signaling	Requires standardization	Cross-Layer Signaling Method	Scope	Propagation Latency	Communication overhead	Cross-Layer Signaling Method
			Interlayer Signaling Pipe				**Interlayer Signaling Pipe**
Medium	Path dependant	√	Packet Headers	Local	Medium	High	Packet Headers
Medium	Path dependant	×	Packet Structures	Local	Medium	High	Packet Structures
			Direct Interlayer Communications				**Direct Interlayer Communications**
High	Path independent	√	ICMP messages	Local	Low	Medium	ICMP messages
Low	Path independent	×	Callback functions	Local	Low	Low	Callback functions
Low	Path independent	×	**Central Cross-layer Plane**	Local	Low	Low	**Central Cross-layer Plane**
			Network-wide Cross-layer Signaling				**Network-wide Cross-layer Signaling**
Medium	Path dependant	√	Packet Headers	Local/Network-wide	High	Low	Packet Headers
High	Path independent	√	ICMP messages	Local/Network-wide	High	High	ICMP messages

Table.1 Examination of the cross-layer flagging Method

VI. Conclusion

We tended to the need on the other hand a Cross Layer approach in remote portable Adhoc Networks. Cross layer criticism is crucial on the other hand improving the execution of layered convention stacks sent over portable remote networks. We looked at different Cross layer signaling architecture's parameters/metrics and understands its merits and demerits. This reseek work has giving the basic requirement of cross layer plan in portable networks. In the Versatile Adhoc network, cross-layer plan permits the convention have a place to distinctive layers which participate in sharing system status information while still keeping up the layers partition at the plan level. Cross-layer plan has been proposed to keep up the functionalities related to the one of a kind layers in any case to permit coordination, affiliation and joint improvement of conventions crossing distinctive layers. Too the constraints in ISO/OSI, TCP/IP layered conventions are eliminated and the execution is made strides by adopting cross layer plan in remote portable Adhoc networks.

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