

# Mobile IT for Mobile Workforce



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Your employees are spending more hours working away from their desks: working from home, working on the road, working in meetings, working at customer sites. Across industries, professionals and knowledge workers perform their work away from their desks more than half the time.

An IT infrastructure designed primarily to provide services to your employees' desk is no longer in sync with the business needs.

To ensure maximal productivity, you need to provide IT services that follow the users: one where all the business data and applications, computation and communication services follow the users. We call an infrastructure with such "follow-me" capabilities a Mobile IT Infrastructure.

### **Building a Mobile IT Infrastructure with HP-UX 11i v2 for HP 9000 and Integrity**

Wireless technologies and highly capable mobile devices are important and necessary elements of a Mobile IT Infrastructure but they are not sufficient.

A Mobile IT Infrastructure needs to address the following issues.

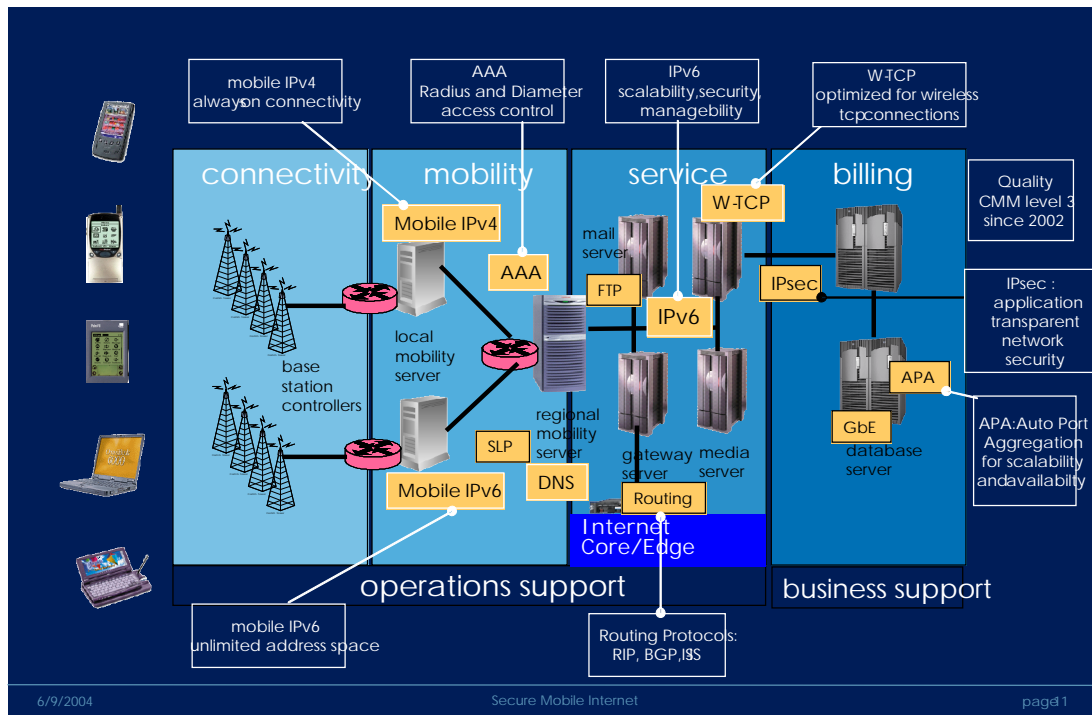
- identification – how to identify a mobile device in a global context
- transport – how to track and route services to a mobile device
- security – how to ensure the secure delivery of services to a mobile device

Indeed, the challenge is not so much at the edge of the network but the network infrastructure itself.

Based on the experience of HP-UX networking engineers, the following is a high level blueprint for building a Mobile IT Infrastructure,

- Begin with HP-UX 11i's industry-leading, high-performing, highly-available Internet services.
- Enable the productive use of any mobile personal products, including all of HP's personal products.
- Allow the user to connect to the network via either Local (e.g. cell network access, or public wireless LAN) or Regional (e.g. dial-up) Mobility Access servers.
- Use functionality that is compliant with Internet Standards to ensure interoperability and avoid proprietary functionality.
- Use Wireless-TCP to ensure high network throughput.
- Use IPv6 to provide a mobile device with a globally unique identity.
- Use Mobile-IP to allow the user's device to connect AND continue to roam without dropping the connection or having to re-gain permission to use the network.
- Use AAA to make sure that the user and the device are allowed to connect to the network
- Use IPSec. to ensure communication security

This is illustrated by the following diagram.



HP understands customer solutions for mobility can be either IPv4 based, IPv6 based, or a combination of IPv4 and IPv6. This is why HP-UX offers a dual-stack networking stack within an HP-UX box to accommodate a robust set of mobile business applications/solutions (such as email, messaging, voice, video conferencing).

In the following, the foundational components of a mobile IT infrastructure are further described.

## HP-UX Wireless TCP

Wireless networks pose unique challenges to the networking professionals. Performance is degraded considerably by the lower bandwidths in wireless links and the retransmission of packets caused by higher error rates due to a variety of factors. The movement of the mobile device as it moves from one location to another leads to further packet loss. HP's Wireless TCP provides the reliability needed to meet these technology challenges.

To address these challenges, the HP-UX 11i networking team worked very closely with our customers on the development and deployment of Wireless TCP. *Wireless TCP on the HP-UX 11i networking stack is being used extensively in wireless network environments, including a customer with over 43M mobile subscribers accessing the Internet using cell phones.*

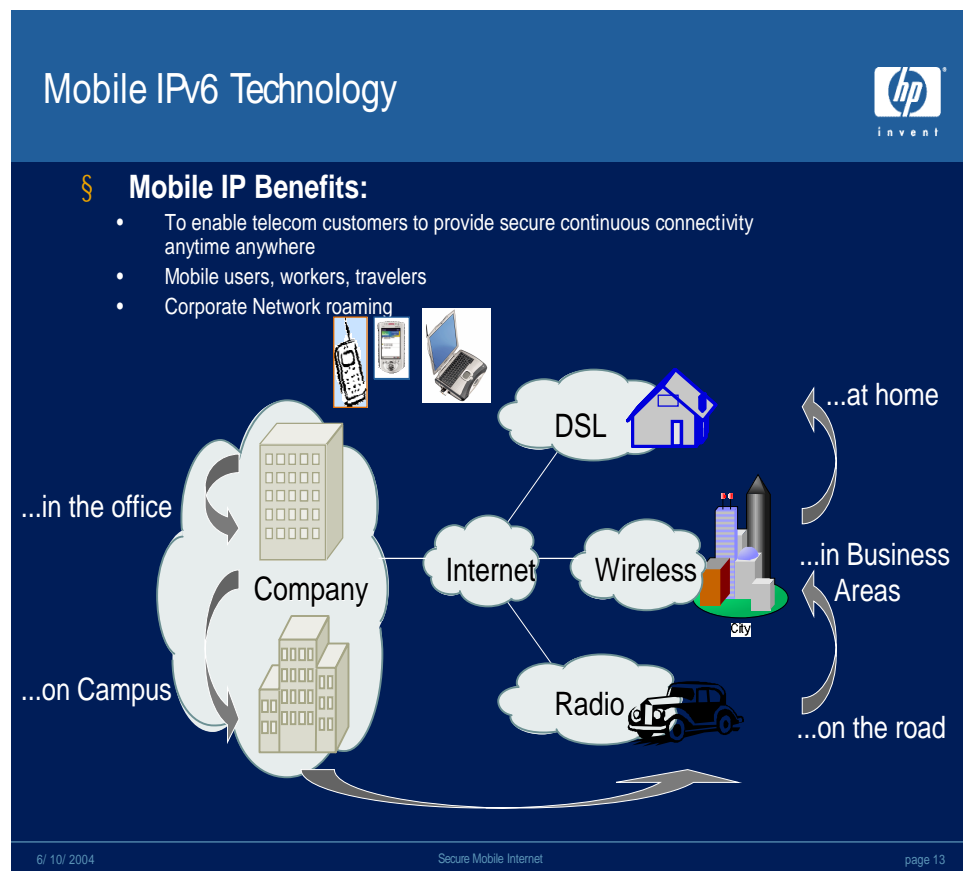
HP-UX 11i has optimized its TCP layer to maximize wireless traffic throughput. Numerous IETF standards and features were added to HP-UX 11i's transport stack such as

- RFC 1191 - Path MTU Discovery
- RFC 1323 - TCP Extensions for High Performance
- RFC 2018 - TCP Selective Acknowledgement Options

- RFC 2414 - Increasing TCP's Initial Window
- RFC 2581 - TCP Congestion Control
- RFC 3042 - Enhancing TCP's Loss Recovery Using Limited Transmit
- Support of larger-than-default IP MTU size
- Smoothed RTO algorithm (non-IETF spec)

## HP-UX Mobile IPv6

HP-UX 11i Mobile IPv6 enables users with portable handheld devices or laptops to roam throughout the Internet from one domain to another while constantly communicating (maintaining the same connection) to a remote application or service without interruptions.



This product, designed for a IPv6 network infrastructure, consists of two Mobile IPv6 components: Home Agent and Correspondent Node. The **Home Agent** is for those customers such as service providers who need to provide mobility service to Mobile Nodes that administratively belong to them. The **Correspondent Node** is for any IPv6 device or system owner who wants to provide MIPv6's route optimization support to Mobile Nodes that will directly communicate to the IPv6 device or system bypassing the Home Agent.

The HP-UX 11i Mobile IPv6 design and implementation takes advantage of the following IPv6 features.

- A large IP address space to eliminate the need for private addresses and network address translation
- Stateless autoconfiguration for allocating a home address
- Authentication Header and Encapsulated Security Payload IPv6 extension for security
- IPv6 Routing header for better performance and less overhead

#### **Benefits of HP-UX Mobile IPv6:**

- Designed for Multi-Processor scaling
- Uses IPSec for message authentication and required end-to-end security for user data
- Extensive interoperability testing and multi-vendor verification at TAHI project forums and Connectathon bakeoffs
- Intuitive, easy to use configuration and administration tools which includes HP's nettl tracing tool for Mobile IPv6 packet tracing

Mobile IPv6 product is bundled with TOUR 2.0 and can be obtained through HP's Software depot ([www.software.hp.com](http://www.software.hp.com))

#### **HP-UX Mobile IPv6 is based on the following IETF Standards:**

- RFC 3775 - Mobility Support in IPv6
- RFC 3776 – Using IPSec to Protect Mobile IPv6 Signaling Between Mobile Nodes and Home Agents

## **HP-UX Mobile IPv4**

HP-UX Mobile IPv4 provides IP mobility support for IPv4 networks. It implements a protocol that allows transparent routing of IP packets sent by any node that needs to communicate with the mobile node.

The mobile node (terminal) is always identified by its home address, regardless of its point of attachment to the Internet. In the home network, a server (Home Agent) is assigned to a mobile node. The Home Agent is responsible for keeping track of the mobile node as it moves from one domain to another domain and the forwarding of packets to the mobile node. The router (Foreign Agent) on the foreign network is used to detect the presence of the mobile node and to notify the Home Agent where the mobile node is currently located.

HP-UX Mobile IPv4 includes three important features: robust route optimization, AAA support and reverse tunneling.

Deployed with the HP-UX AAA Server, it provides authentication for mobile devices. Used in the AAA mode, the Home AAA server becomes a key generation and distribution center for mobile components (HAs, FAs, and MNs), eliminating the key configuration nightmare for system administrators.

Built for interoperability in multi-vendor environments, HP designed Mobile IPv4 to offer minimal mobile node hand-off latency (smooth hand-off). The Reverse Tunneling feature allows traffic to pass through routers that impose Ingress Filtering rules. Interoperability testing with leading mobile clients on the Windows and Linux platforms have also been performed.

This product can be used to support wired and wireless LAN topologies for use on corporate networks, university campuses, hotspots, and enterprise solutions.

**HP-UX Mobile IPv4 is based on the following IETF Standards and drafts:**

- RFC 3344 - IP Mobility Support for IPv4
- RFC 2344 - Reverse Tunneling for Mobile IP
- RFC 2794 - Mobile IP Network Access Identifier for IPv4
- RFC 3012 - Mobile IPv4 Challenge/Response Extensions
- Draft-ietf-aaa-diameter-mobileip-08
- Draft-ietf-aaa-diameter-08
- Draft-ietf-mobileip-optim-11
- Draft-ietf-mobileip-aaa-key-10

## HP-UX AAA Server

Security is a critical element in mobility deployment. When a mobile node contacts the Home Agent for accessing its home network, there is a need to ensure that the node is the one that it claims to be (Authentication) and is allowed to access the services (Authorization) and applications that it is requesting. Once authenticated and authorized, the mobile node's resource usage is monitored for accounting reasons (Accounting).

These functionalities are provided by an AAA server. As a Mobile Node roams into a foreign domain, the AAA server on the foreign domain must communicate with the Mobile Node's home AAA server to authenticate the credentials of the mobile node and grant the user access to the foreign domain it has entered.

The HP-UX 11i AAA Server is a Remote Authentication Dial-In User Service (RADIUS)-compliant access policy server; providing authentication, authorization and accounting (AAA) solutions for controlling user access to network resources.

The HP-UX 11i AAA Server provides user authentication by identifying passwords, authorization of services and applications, and accounting for users accessing the network.

It is a scalable, very powerful solution that supports a wide array of network topologies and authentication requirements. It is built on a modular and object-oriented architecture, and is designed to deliver high performance. Maintaining the integrity of remote and local access account management is critical while mobility deployment grows. The AAA Server eliminates or reduces the need for separate access control systems for different access methods (such as dial in vs. wireless LAN) providing better quality of administration.

## HP-UX 11i IPsec

HP-UX 11i IPsec provides authentication, integrity, and confidentiality of end-to-end communication ensuring that the data exchange is done in a secure way. It implements a family of interrelated protocols,

including the Authentication Header (AH), the Encapsulating Security Payload (ESP), the Internet Key Exchange (IKE), and the Internet Security Association Key Management Protocol/Oakley (ISAKMP/Oakley).

AH and ESP define encryption and authentication methods for IP payloads. IKE and ISAKMP manage the exchange of secret keys, authenticate the communicating parties, and manage their security associations (SA). IKE dynamically manages and generates the secret cryptography keys used to encrypt and authenticate IP packets. ISAKMP/Oakley allows a receiver to obtain a public key and authenticate a sender using digital certificates.

IPSec supports two encryption modes: Transport and Tunnel. In Transport mode, IPSec provides host-to-host security for a host running IPSec from HP or non-HP vendors. Transport mode encrypts only the data (payload) of each packet, leaving the header unencrypted. In Tunnel mode, IPSec implements tunnels to a gateway running IPSec from non-HP vendors. Tunnel mode encrypts both the header and the payload; the receiving IPSec-compliant device must decrypt each packet.

## HP-UX 11i IPv6

The Internet's tremendous growth rate exceeded greatly any futurist's predictions, including the Internet Protocol (IP) architect's plans from twenty years ago. IP version 4 (IPv4) provided ample addresses for network growth throughout the 1980s, but the address supply is now low, particularly outside the United States. If current Internet growth rates continue, the supply of unassigned IPv4 addresses will be depleted within ten years.

IPv6 is the next generation of the Internet protocol and provides great IP address extensibility, security and manageability.

IPv6 has huge addressing space

IPv4 has approximately 4,000,000,000 32-bit addresses.

IPv6 has approximately 600,000,000,000,000,000,000 128-bit addresses.

IPv6 supports Mobile IP

Billions of new mobile devices require IP addresses, particularly in Europe and Asia where the fastest-growing wireless market has the fewest IP addresses.

IPv6 Supports "plug and play" address autoconfiguration

Address Autoconfiguration allows IPv6 address assignment without manual intervention. An IPv6 Router provides an address prefix (analogous to a subnet) to a host. The host appends the link-level address of its Ethernet Interface to create a globally unique IPv6 address.

IPv6 is secure

IPv6 Standard Specifications require IPSec end-to-end security including authentication and encryption.

HP-UX 11i provides a robust and scalable implementation of the IPv6 protocol and an extensive suite of IPv6-enabled utilities and applications.

### **Current supported RFCs on HP-UX include:**

RFC 1981 Path MTU Discovery for IPv6

\*RFC 2292 Advanced Sockets API for IPv6

RFC 2373 IPv6 Addressing Architecture  
RFC 2374 IPv6 Aggregatable Global Unicast Address Format  
RFC 2375 IPv6 Multicast Address Assignments  
RFC 2452 IPv6 MIB for TCP  
RFC 2454 IPv6 MIB for UDP  
RFC 2460 IPv6 Specification  
RFC 2461 Neighbor Discovery for IPv6  
RFC 2462 IPv6 Stateless Address Autoconfiguration  
RFC 2463 ICMPv6 for IPv6 Specification  
RFC 2464 Transmission of IPv6 Packets over Ethernet Networks  
RFC 2465 MIB for IPv6: Textual Conventions and General Group  
RFC 2466 MIB for IPv6: ICMPv6 Group  
RFC 2473 Packet Tunneling in IPv6  
RFC 2553 Basic Socket Interface Extensions for IPv6  
RFC 2710 Multicast Listener Discovery (MLD) for IPv6  
RFC 2893 Transition Mechanisms for IPv6 Hosts and Routers  
RFC 3019 IP Version 6 Management Information Base for the Multicast Listener Discovery Protocol  
RFC 3042 Enhancing TCP's Loss Recovery Using Limited Transmit  
RFC 3056 Connection of IPv6 Domains via IPv4 Clouds (6to4)

\* Advanced Socket API features from RFC 2292bis, such as Routing Header, Hop-by-Hop, and Destination Option processing are also supported.

## Summary

To ensure maximal productivity for an increasingly mobile workforce, your IT infrastructure needs to be adapted to provide “follow-me” services to your users. The challenge of providing a Mobile IT Infrastructure goes beyond wireless technologies and mobile devices. Important issues in identification, transport and security need to be addressed.

With in-depth technical expertise and extensive practical experience with trend-setting customers, HP-UX networking engineers have gained unique insights on these issues. Their know-how and insight are encapsulated in the implementation of the Wireless TCP, Mobile IPv6, Mobile IPv4, AAA, and IPSec products. These products are the foundational components of a Mobile IT Infrastructure and are available to HP-UX 11i customers at no additional cost.

## Related Documentation

The following documents, available on <http://www.docs.hp.com>, provide additional information on IPv6, Mobile IPv6, and Mobile IPv4 and their related components:

- [\*HP-UX IPv6 Transport Administrator's Guide for TOUR 2.0\*](#)
- [\*Transport Optional Upgrade Release \(TOUR\) 2.0 Release Notes\*](#)
- [\*HP-UX IPv6 Porting Guide\*](#)
- [\*HP-UX Mobile IPv6 A.01.00 Administrator's Guide\*](#)
- [\*HP-UX Mobile IPv6 A.01.00 Release Notes\*](#)
- [\*Introducing HP-UX Mobile IPv6 \(White Paper\)\*](#)

- [\*HP-UX Mobile IPv4 Administrator's Guide\*](#)
- [\*HP-UX Mobile IPv4 Release Notes A.02.01\*](#)
- [\*HP-UX Mobile IPv4 White Paper\*](#)

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