



JavaOneSM
Sun's 1997 Worldwide Java Developer Conference

Building Network Applications for Consumer Devices Using Inferno



Inferno

Lucent Technologies
Bell Labs Innovations



Ron De Lange, VP, Inferno



Inferno

The Network Operating System

- ◆ What is it
- ◆ Key concepts
- ◆ Architecture
- ◆ Building applications
- ◆ Java™ support
- ◆ Product plans



Inferno: What Is It

- ◆ Network Operating System
- ◆ Embodies today's technologies
 - ◆ Virtual Machine
 - ◆ Garbage collection
 - ◆ Real time scheduling
- ◆ Multi-threaded and distributed computing
- ◆ Full featured Operating System



Inferno Key Concepts

- ◆ Scalable: thin clients to Servers
- ◆ Server side computing
- ◆ Application and network portability
- ◆ Secure messaging in the network
- ◆ Seamless legacy system integration
- ◆ Network monitoring and recovery
- ◆ High performance execution



[Inferno Architecture]

- ◆ Files and namespaces
- ◆ Virtual Machine
- ◆ Virtual Operating System
- ◆ Virtual networking



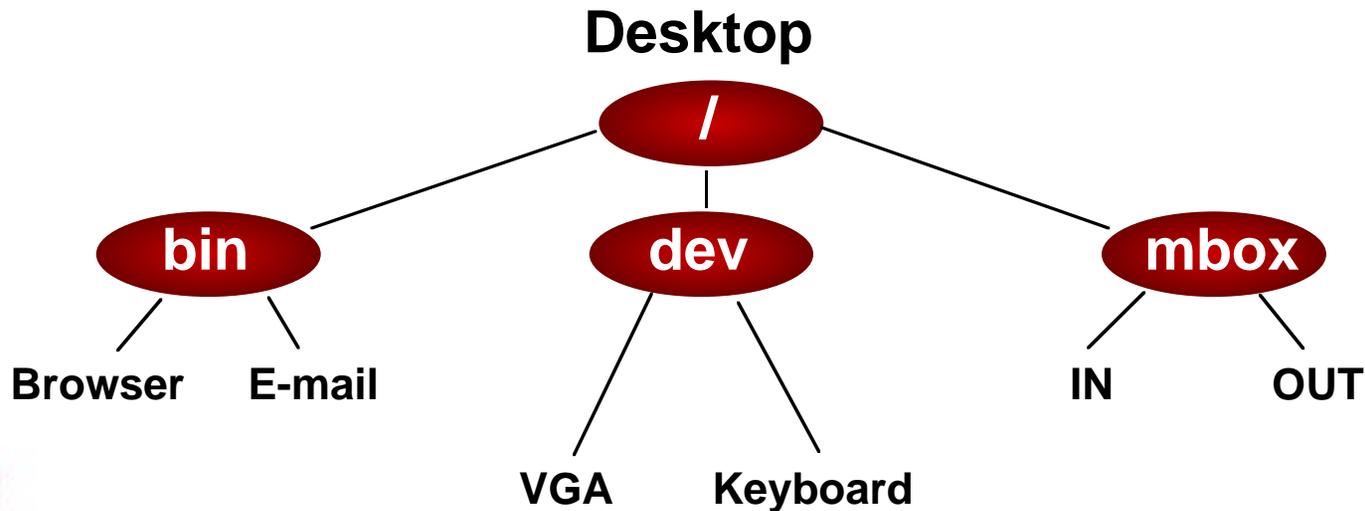
[Inferno: Files and Namespaces]

- ◆ All resources viewed as hierarchical filesystem -- well defined semantics
- ◆ Program's representation of network resources, e.g., files, services, networks, devices, ...
- ◆ Network accessible
- ◆ Customizable per thread



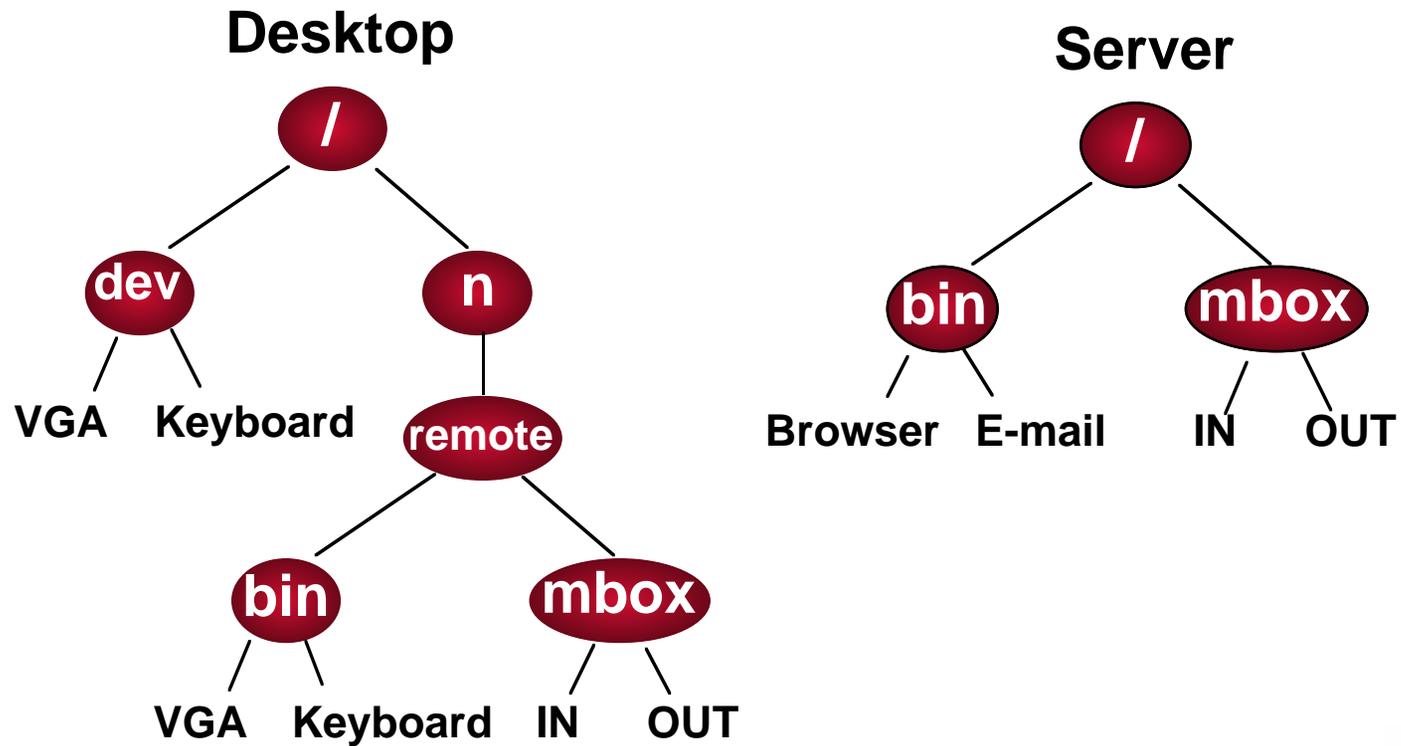
Namespace Example

Today, an ISP distributes access software to the desktop...



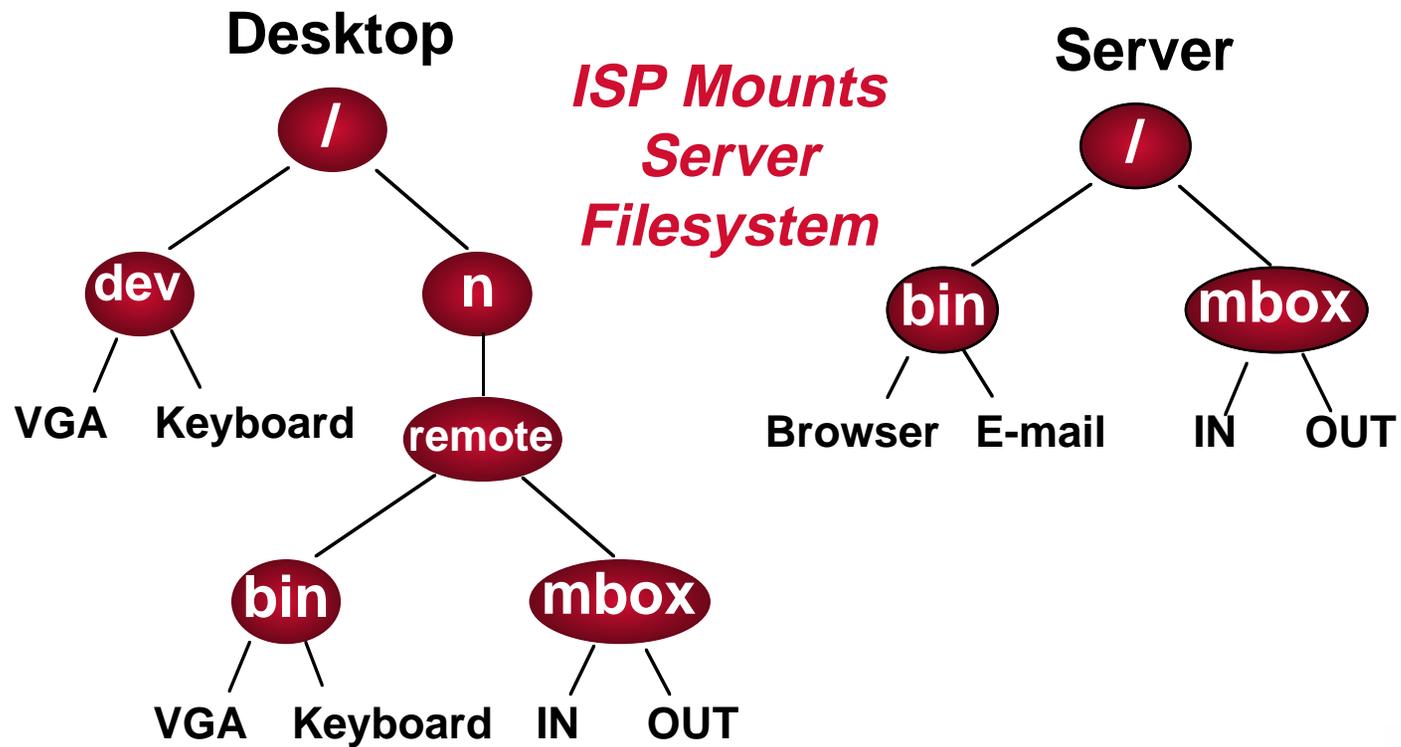
Namespace Example

ISP wants to centralize browser and E-mail...

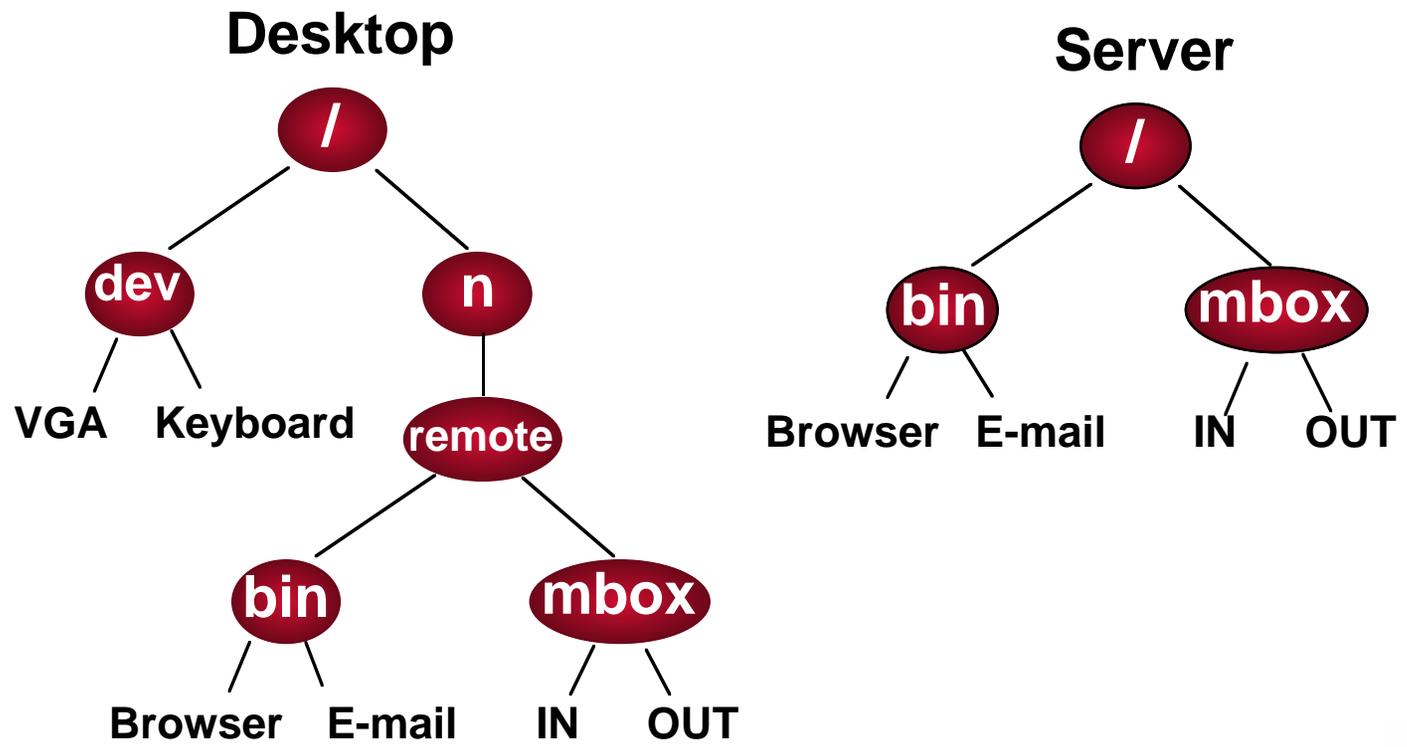


Namespace Example

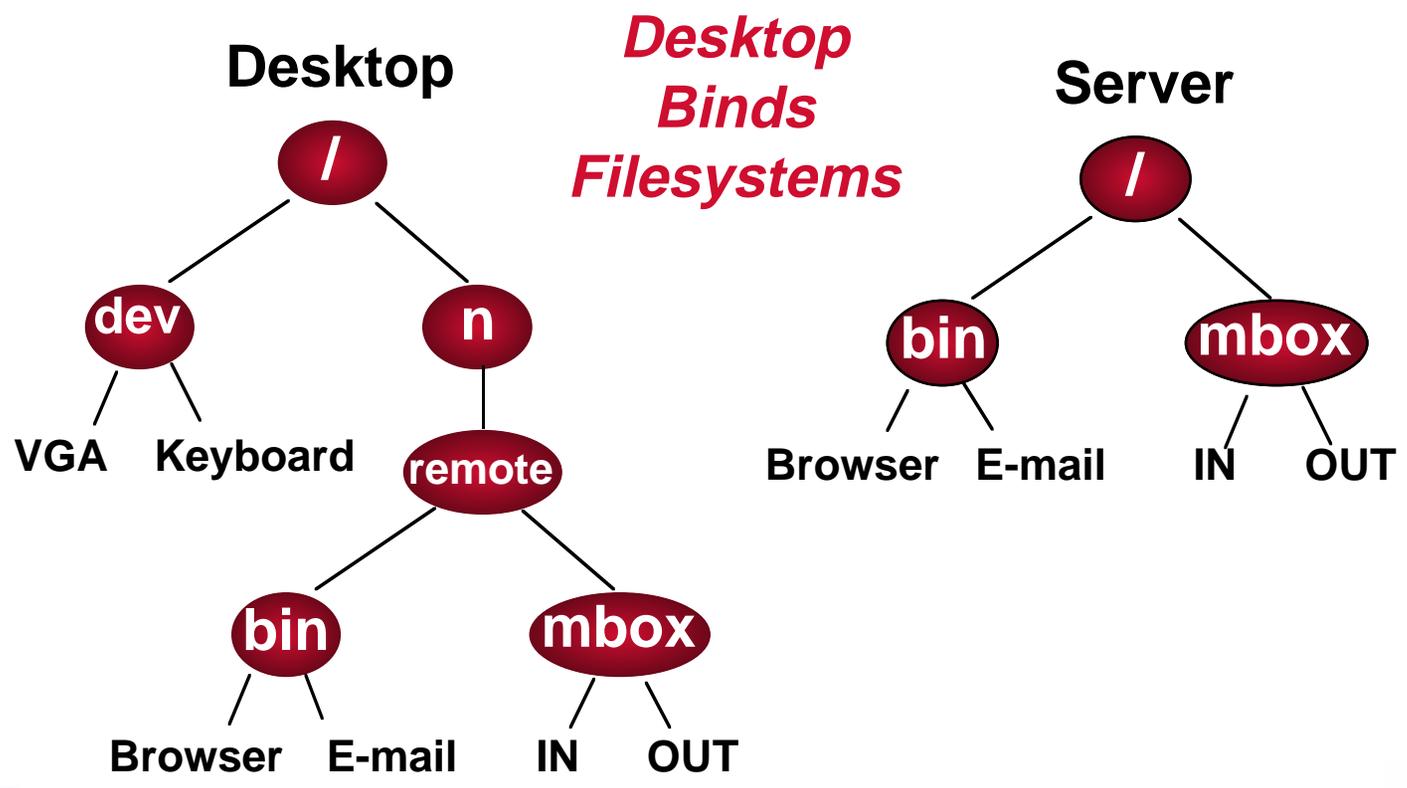
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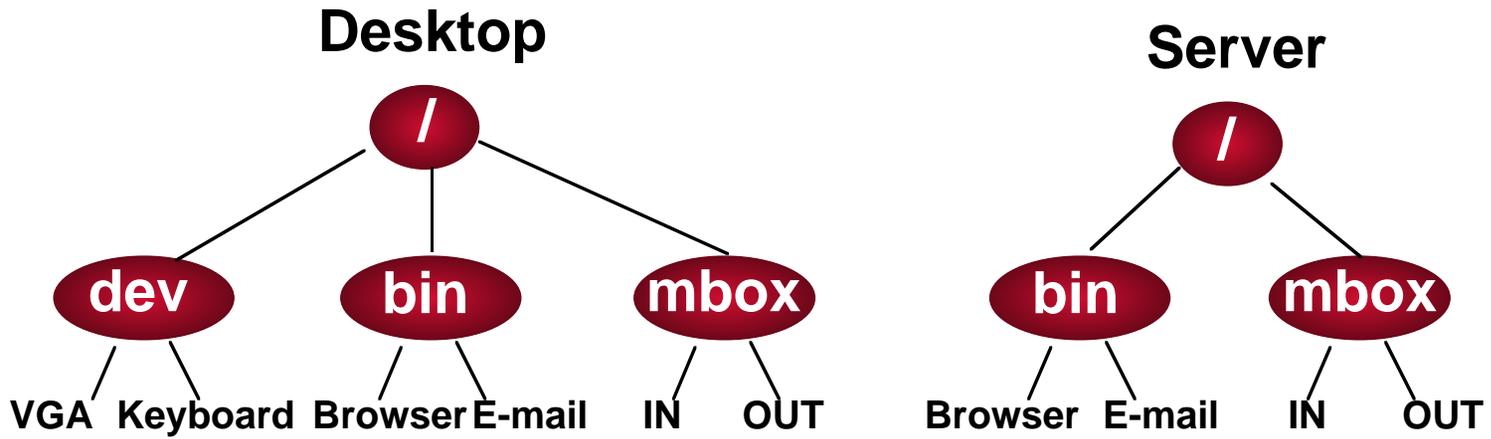
Namespace Example



Namespace Example

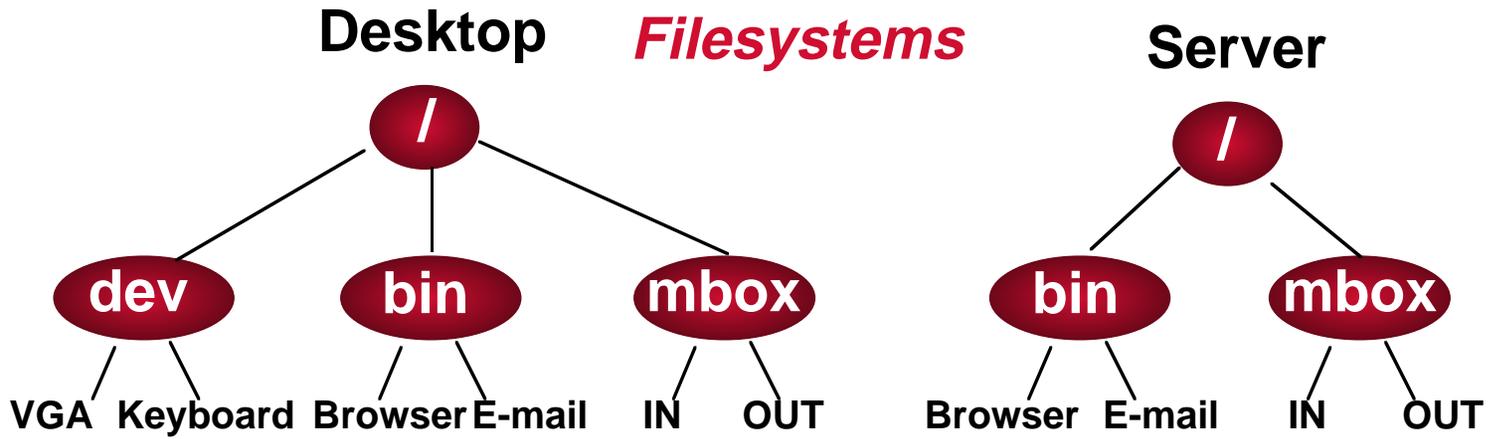


Namespace Example



Namespace Example

*Desktop
Binds
Filesystems*

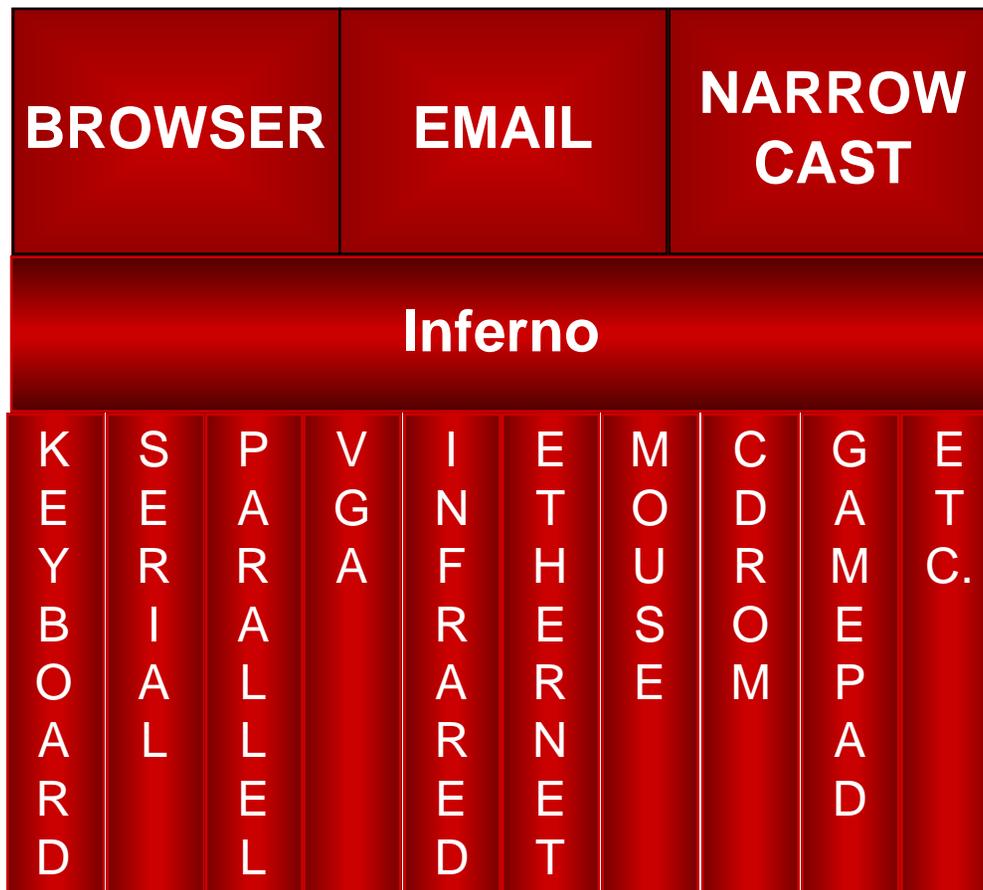


[Inferno: Virtual Machine+OS+Network]

- ◆ Source and binary portability across all Inferno environments
- ◆ System calls identical across all Inferno environments
- ◆ Network abstraction layer hides specifics of protocols
- ◆ Insulated from system configuration changes



[Inferno Is Genuinely Small]



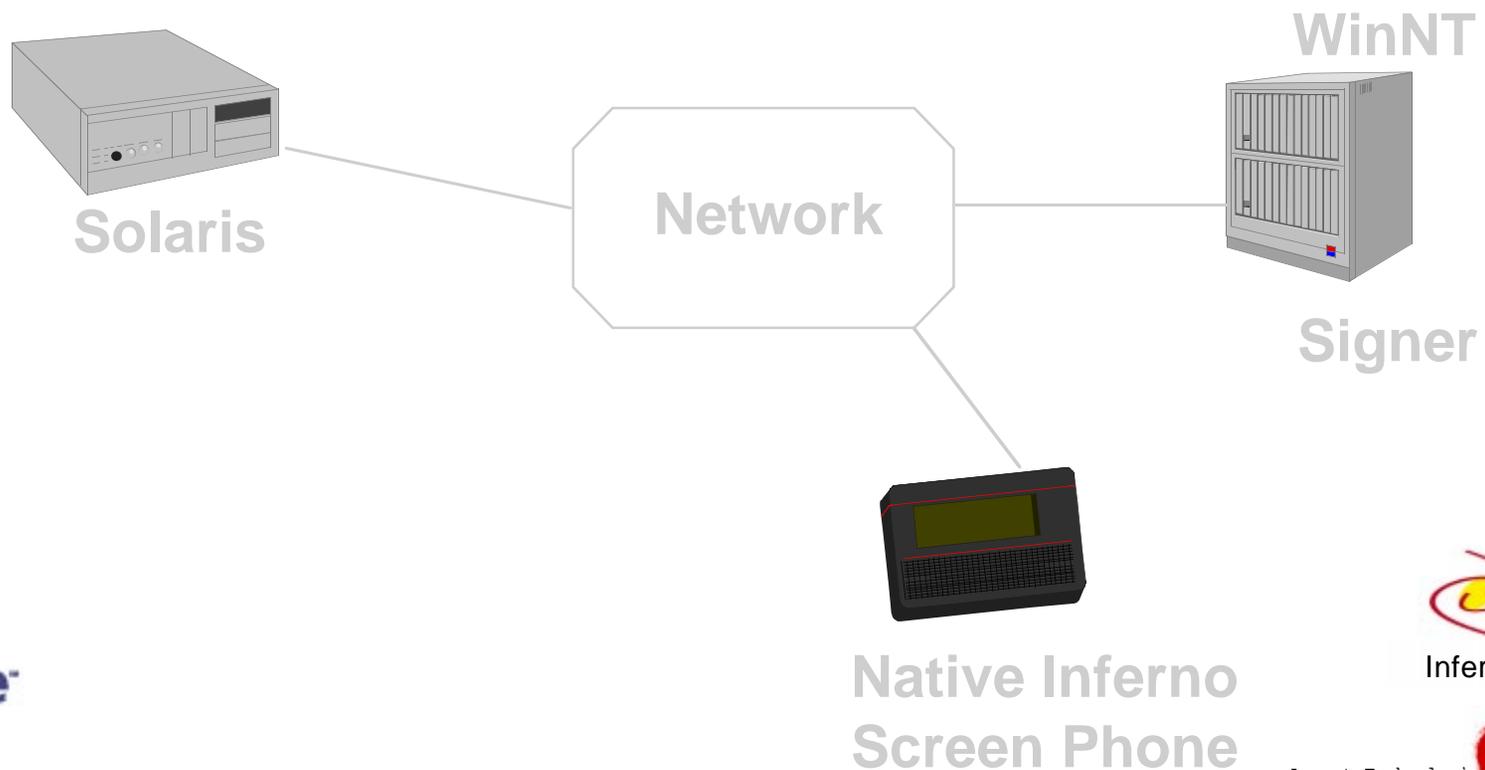
**TYPICAL
SIZES**

STB:

**SCREEN
PHONE:**



Inferno Offers a New Level of Security

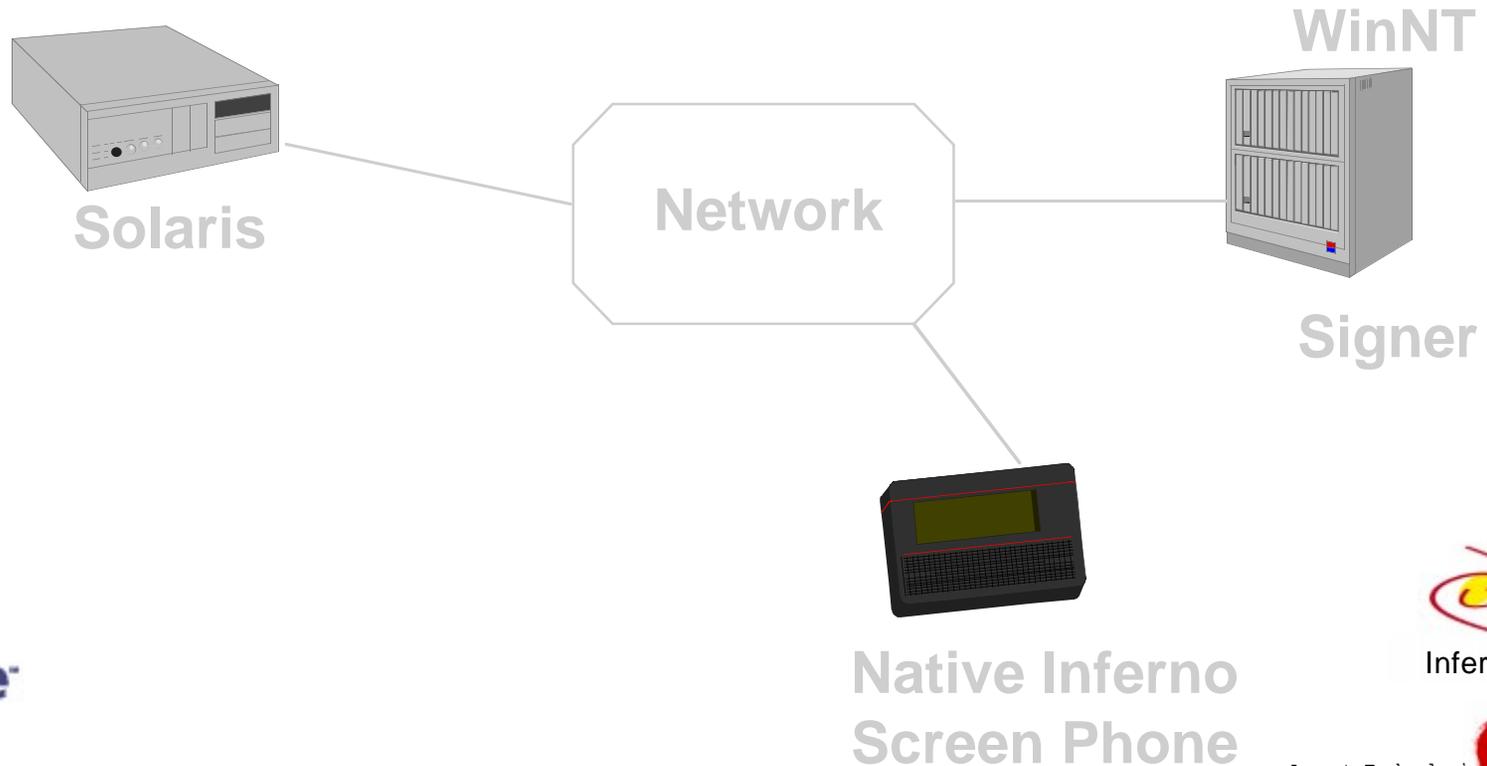


<http://www.lucent.com/inferno>



Inferno Offers a New Level of Security

- Embedded in Kernel

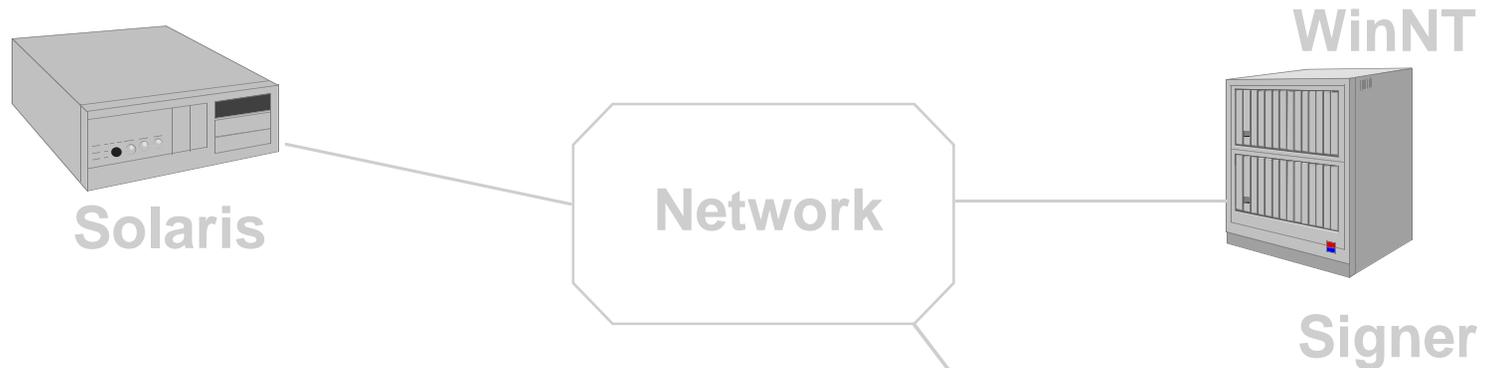


<http://www.lucent.com/inferno>



Inferno Offers a New Level of Security

- Embedded in Kernel



1. Request certificate



Inferno

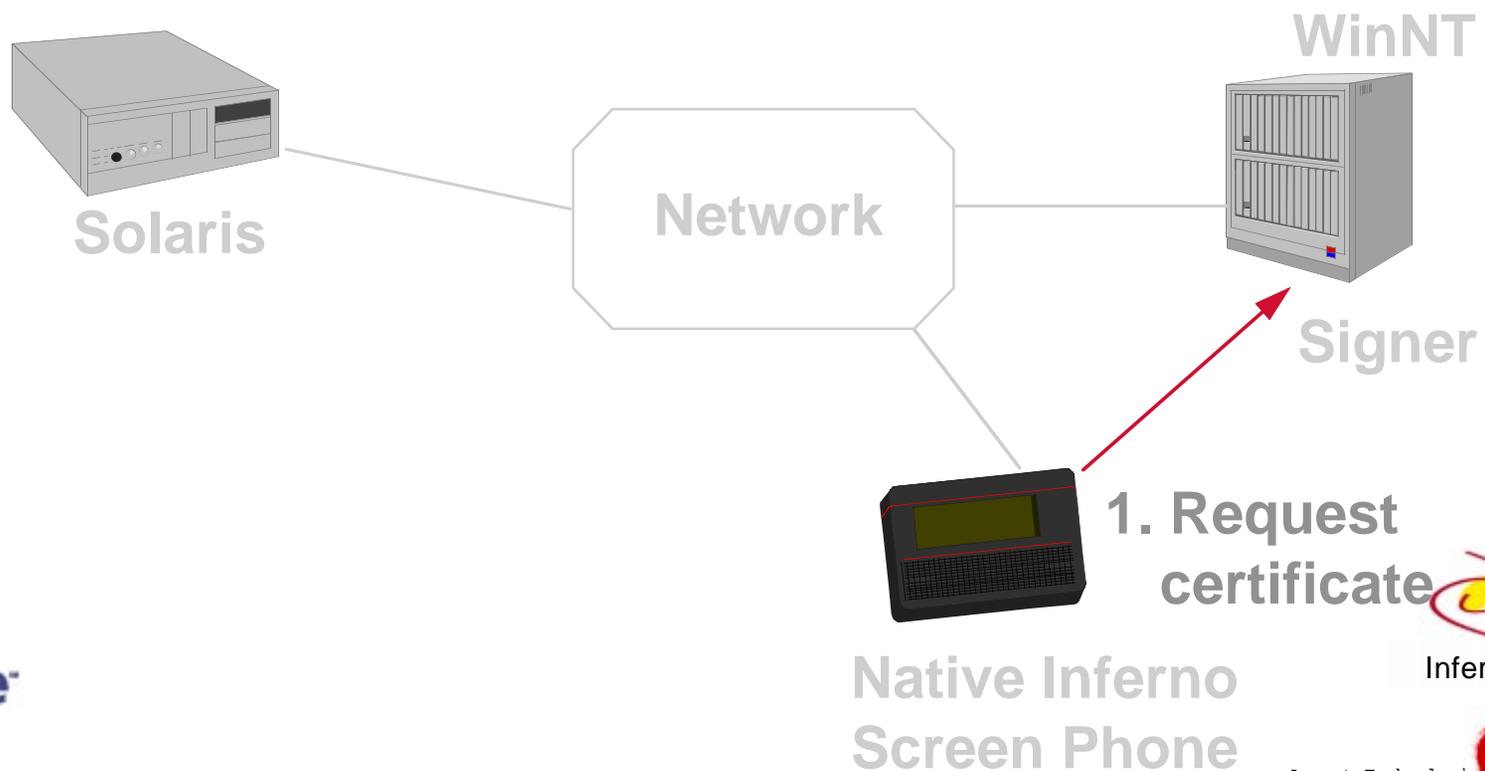
Native Inferno
Screen Phone

<http://www.lucent.com/inferno>



Inferno Offers a New Level of Security

- Embedded in Kernel



<http://www.lucent.com/inferno>



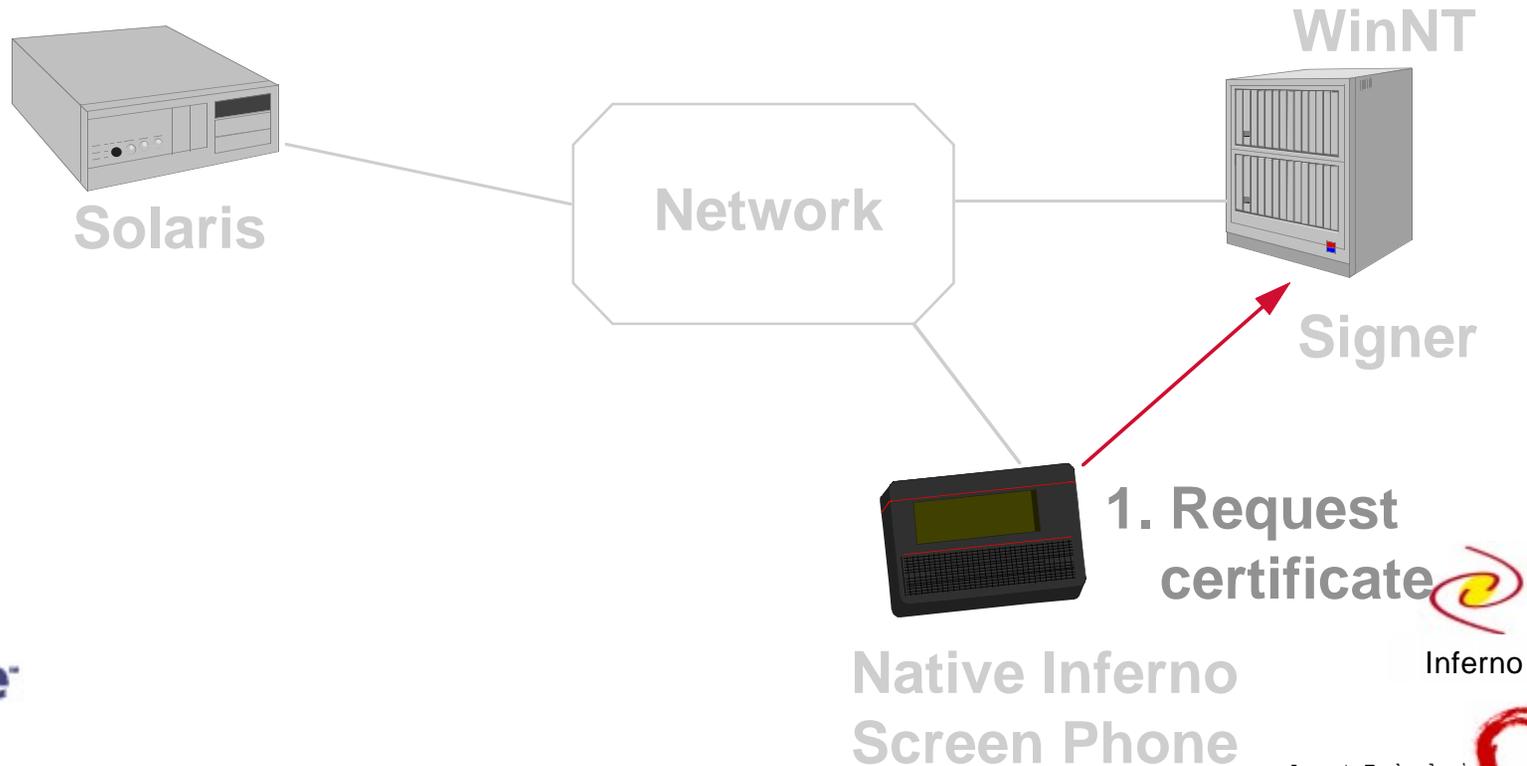
Inferno



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1. Request certificate



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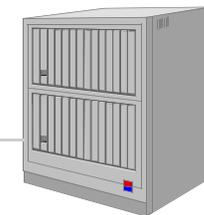


Solaris



Network

2. Send certificate



WinNT

Signer



1. Request certificate

Native Inferno
Screen Phone



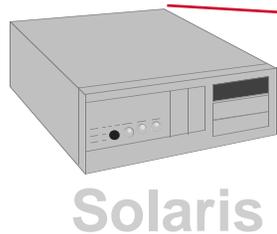
Inferno



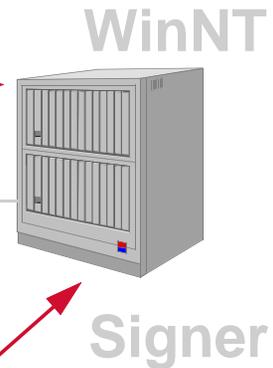
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- Embedded in Kernel

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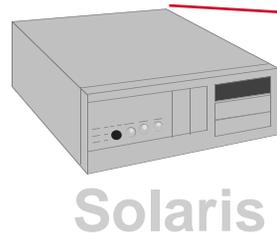
Native Inferno
Screen Phone



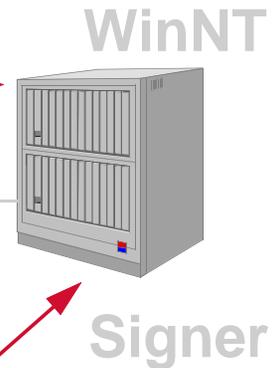
Inferno Offers a New Level of Security

- Embedded in Kernel
- **Mutual Authentication**

1. Request certificate



2. Send certificate



1. Request certificate

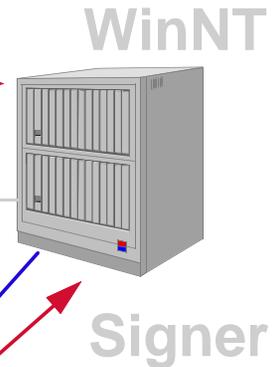
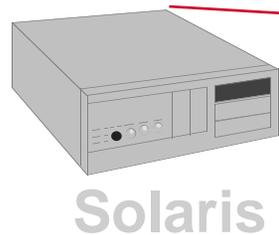


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- **Mutual Authentication**

1. Request certificate

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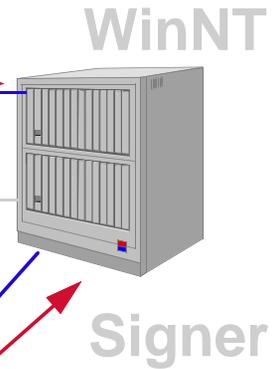
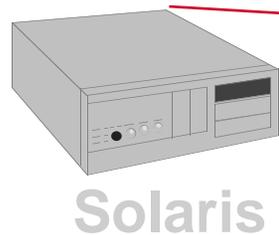


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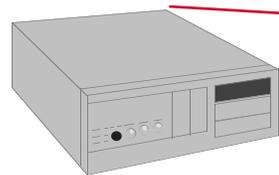


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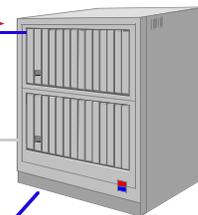
- Embedded in Kernel
- **Mutual Authentication**

1. Request certificate

2. Send certificate



Solaris



WinNT

Signer



Native Inferno
Screen Phone

3. Authenticate

1. Request certificate



Inferno

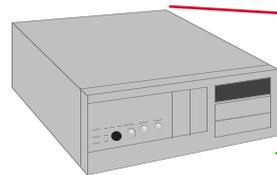


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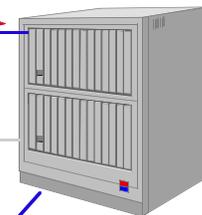
- Embedded in Kernel
- **Mutual Authentication**

1. Request certificate

2. Send certificate



Solaris



WinNT

Signer



3. Authenticate

1. Request certificate



Inferno

Native Inferno
Screen Phone

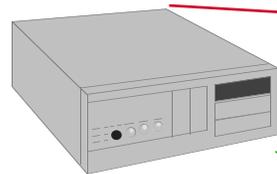


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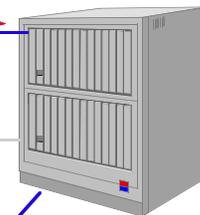
- Embedded in Kernel
- **Mutual Authentication**
- Encryption Digesting, Digital Signatures

1. Request certificate

2. Send certificate



Solaris



WinNT

Signer



3. Authenticate

1. Request certificate

Native Inferno
Screen Phone

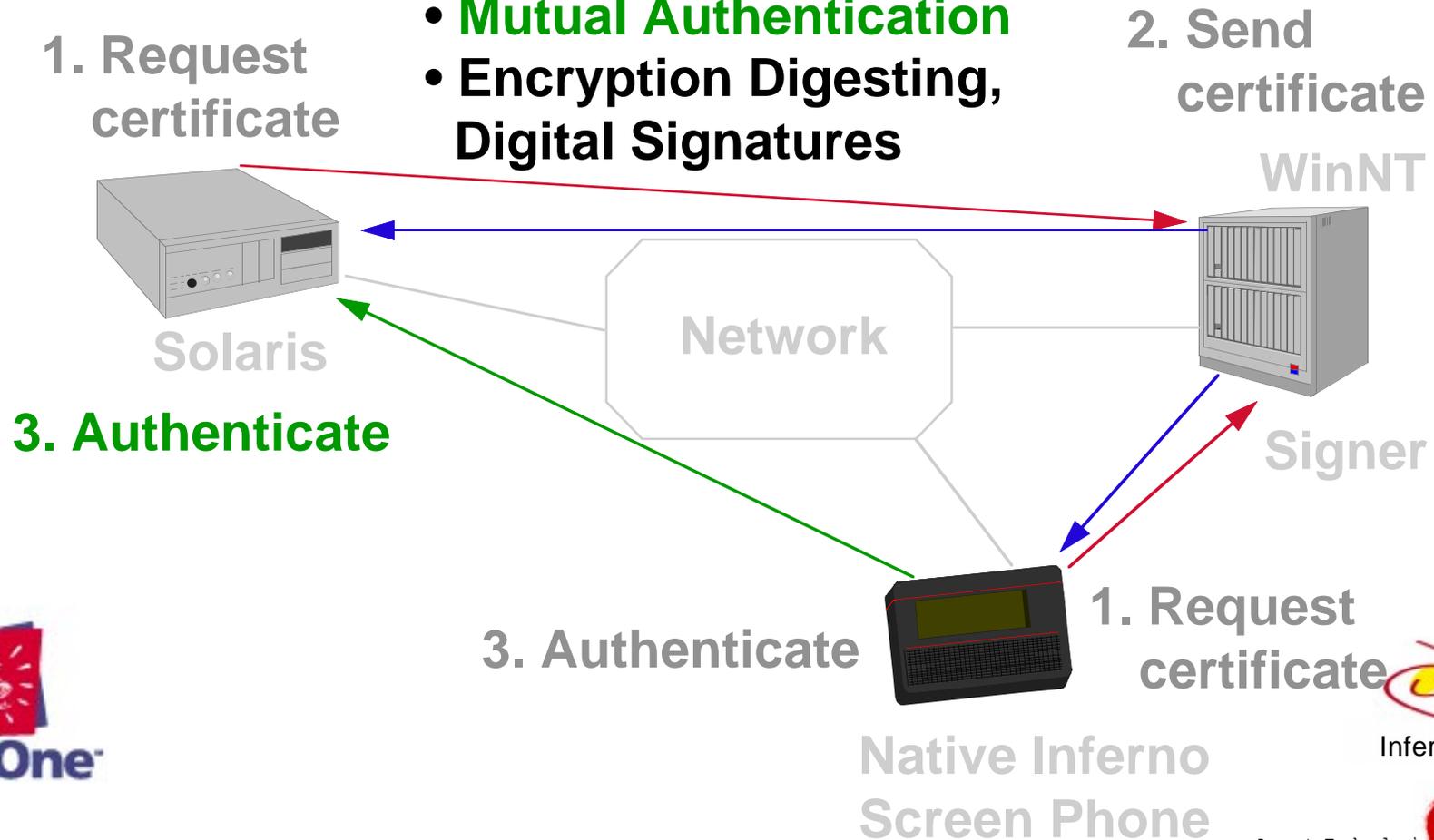


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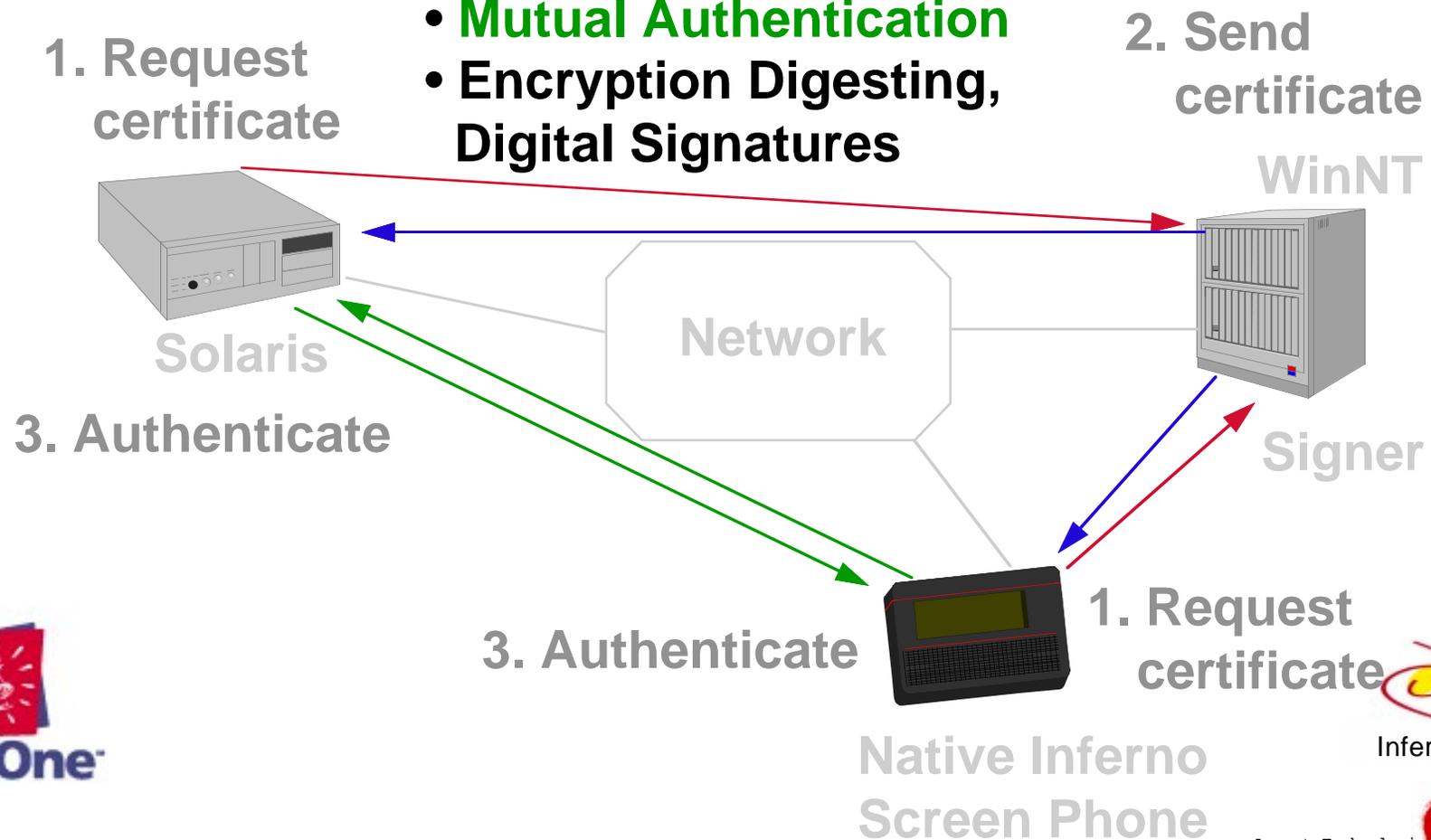
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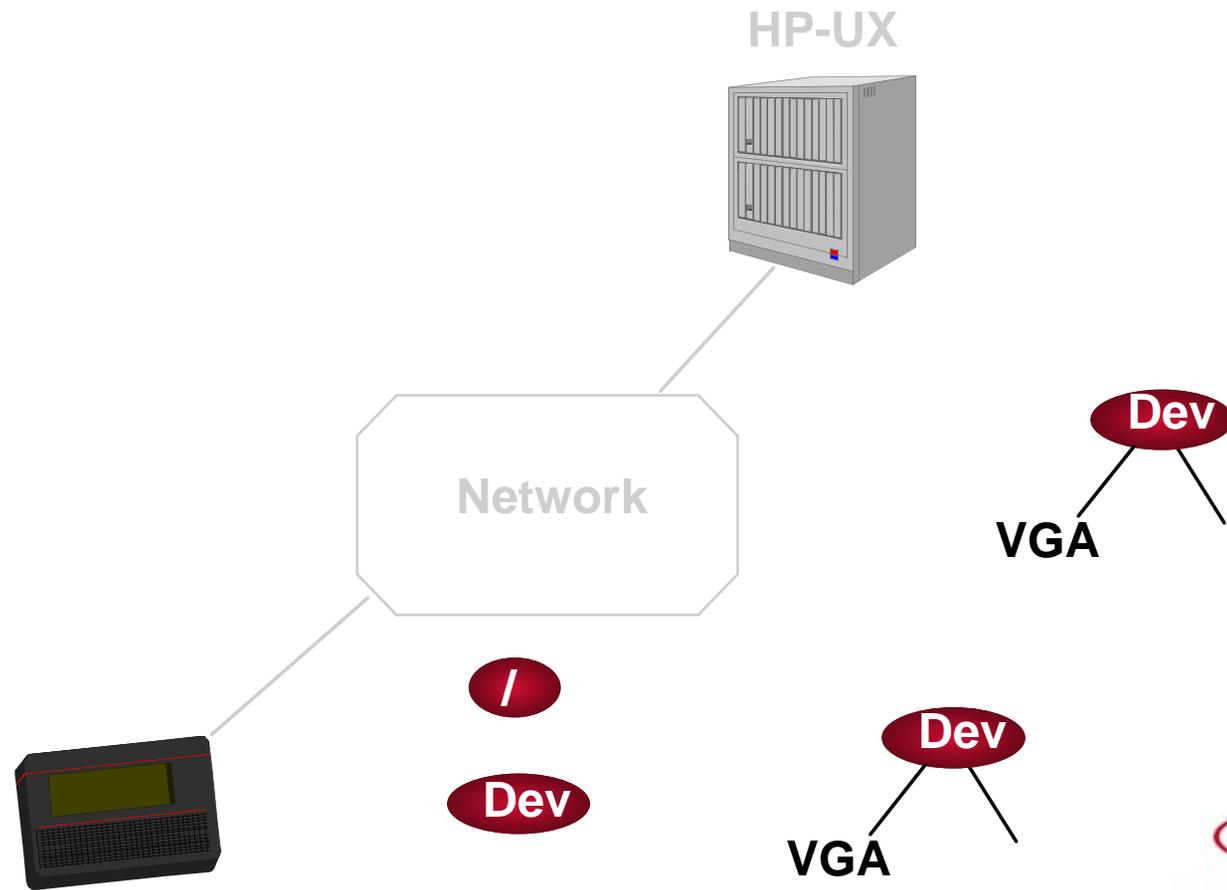


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- Embedded in Kernel
- **Mutual Authentication**
- Encryption Digesting, Digital Signatures



[The Power of the Network at the Client]

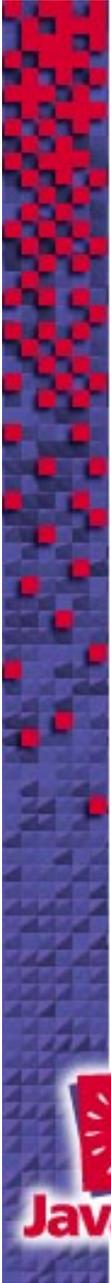
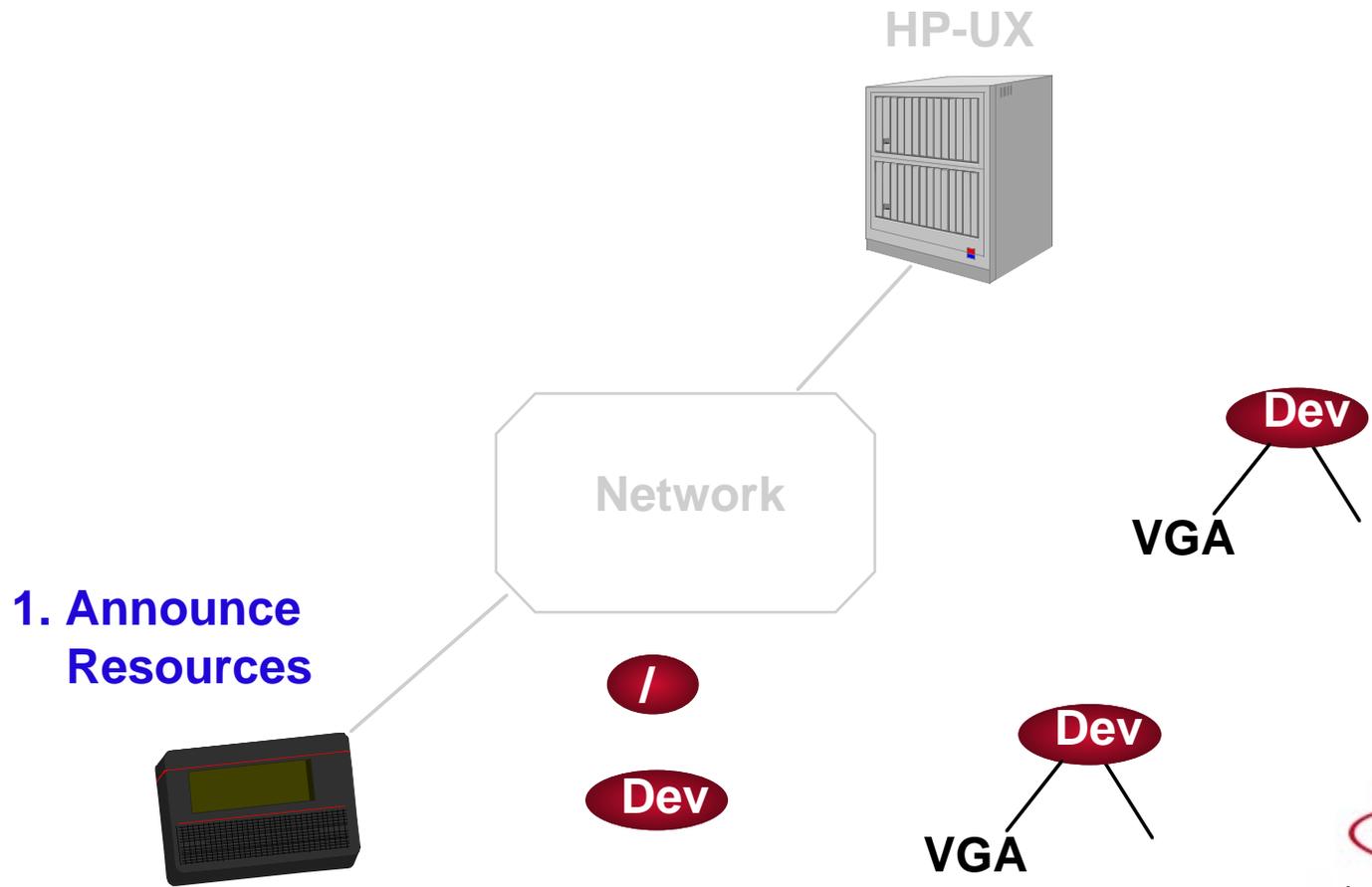


native Inferno N/C

<http://www.lucent.com/inferno>



[The Power of the Network at the Client]

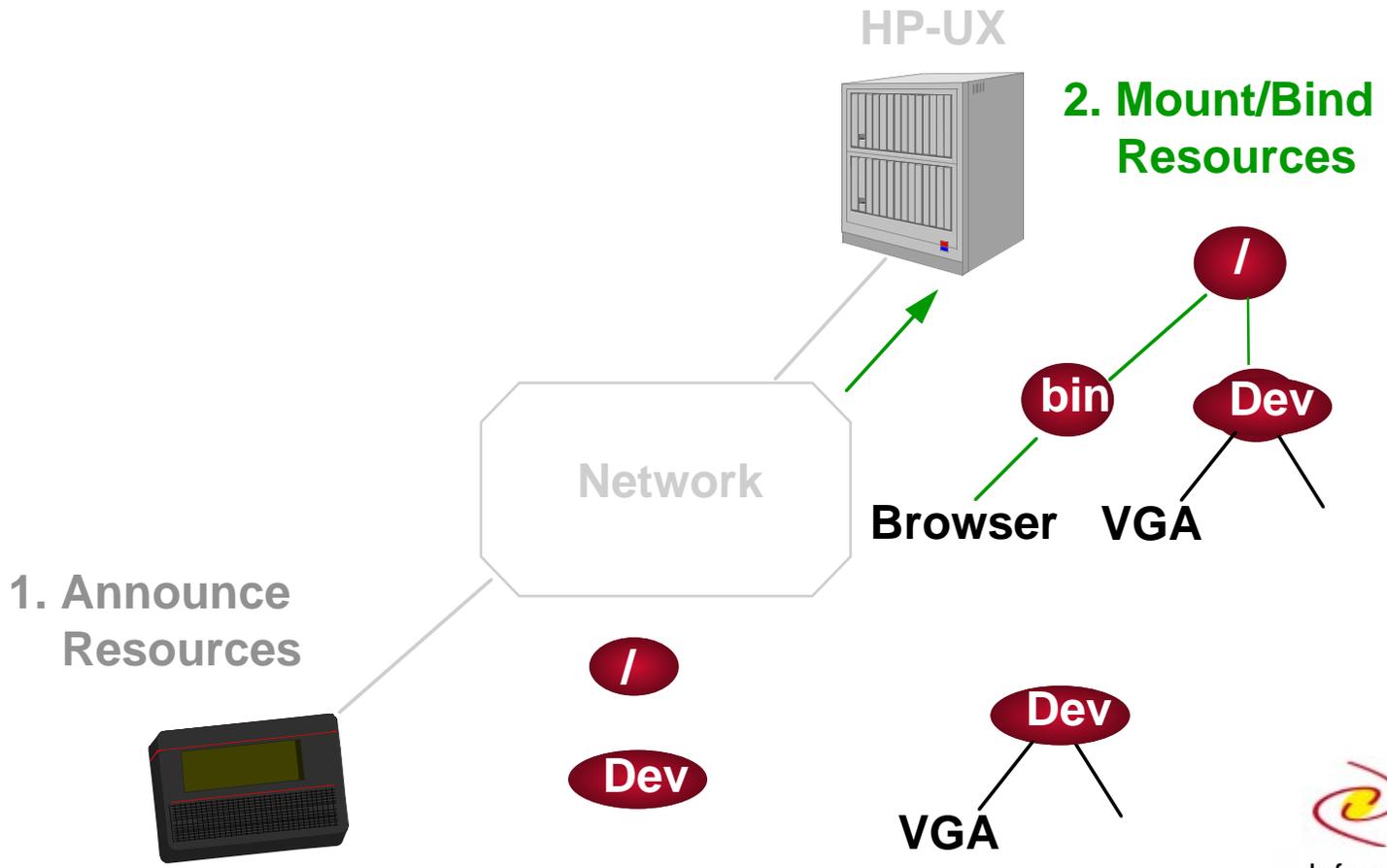


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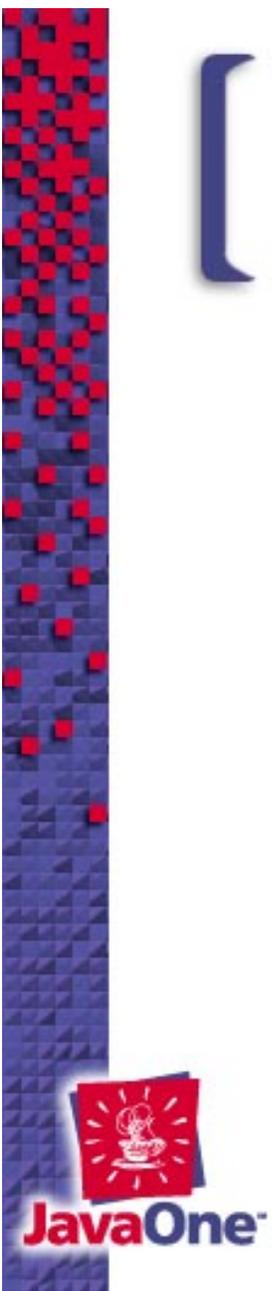
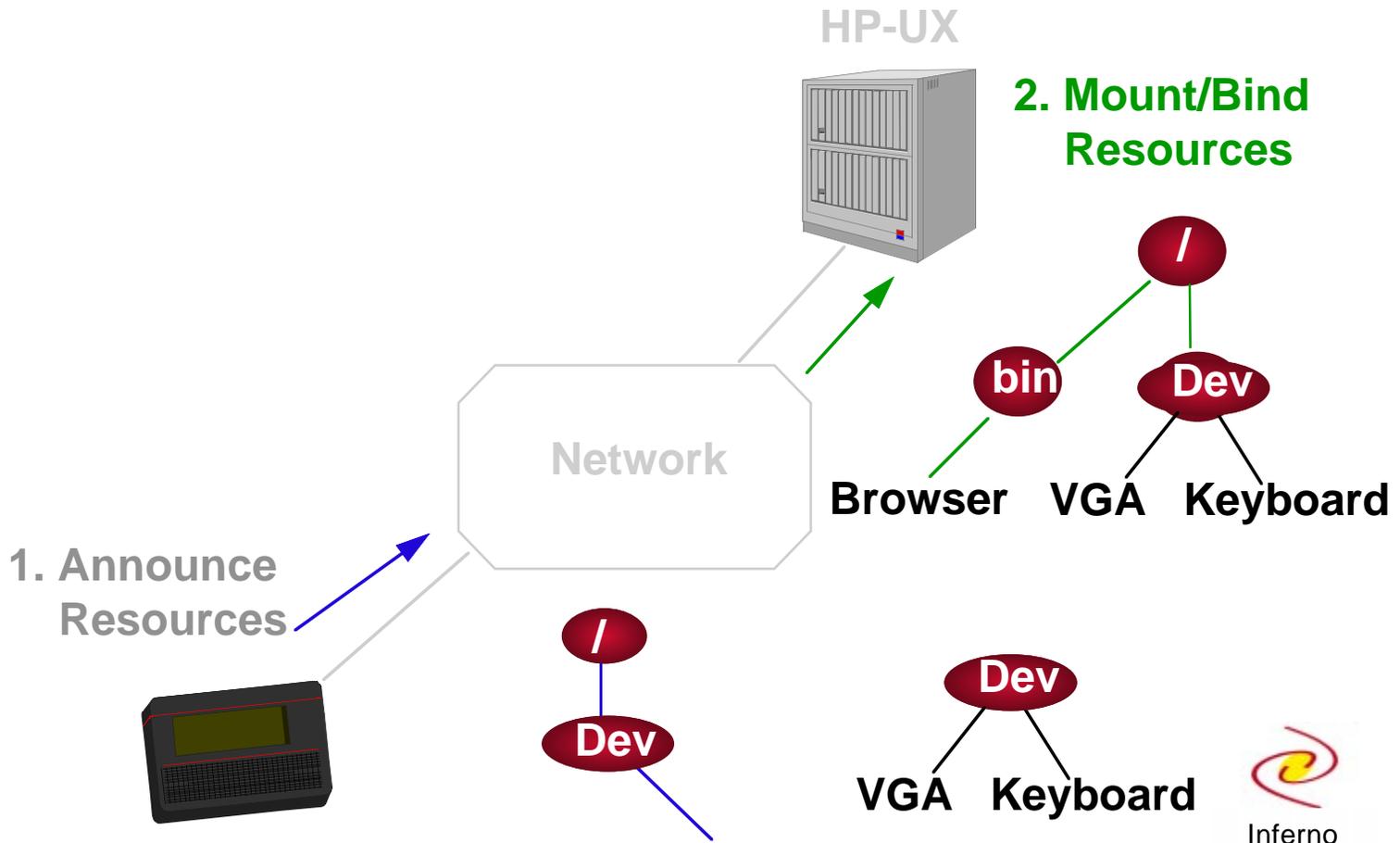


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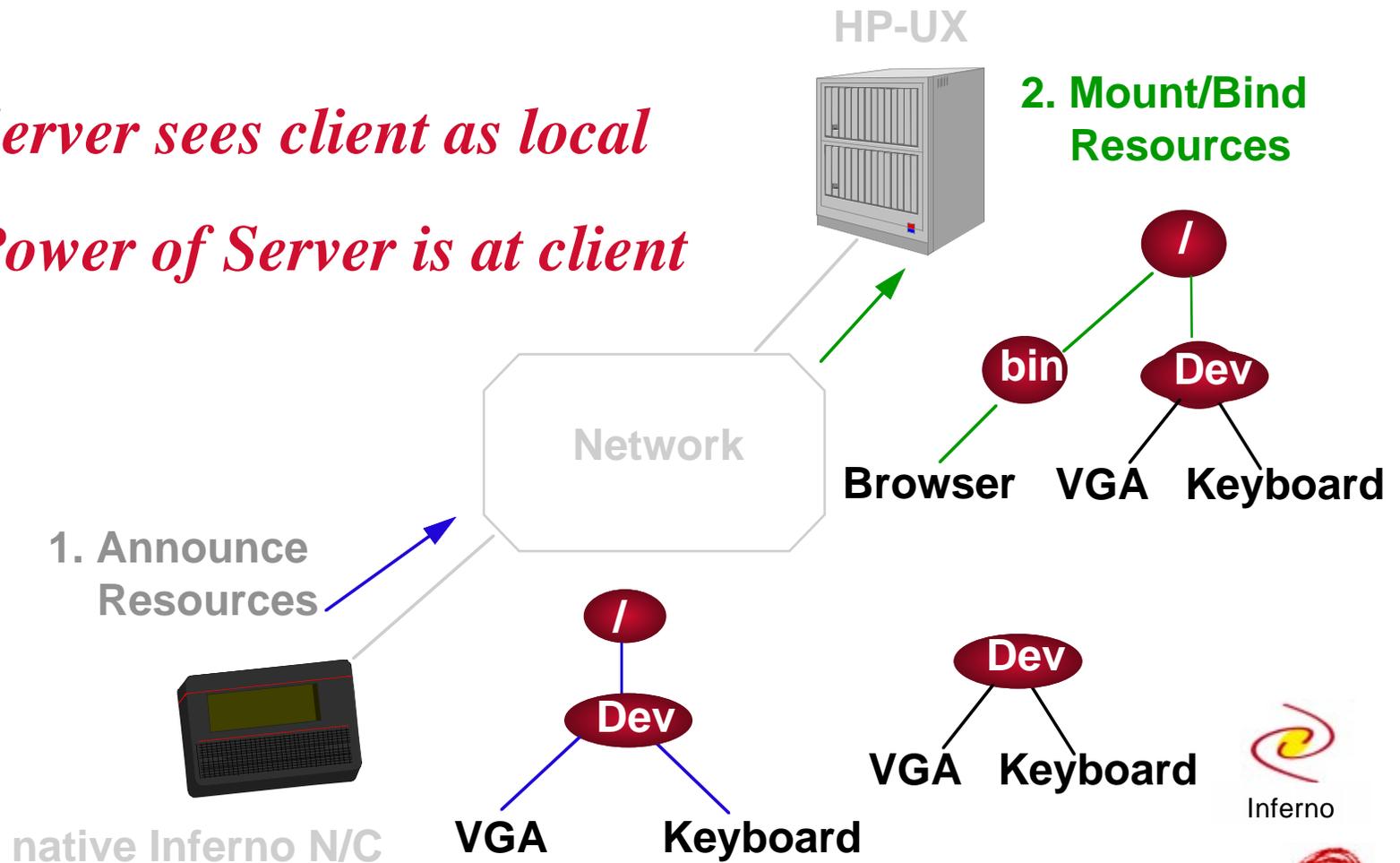
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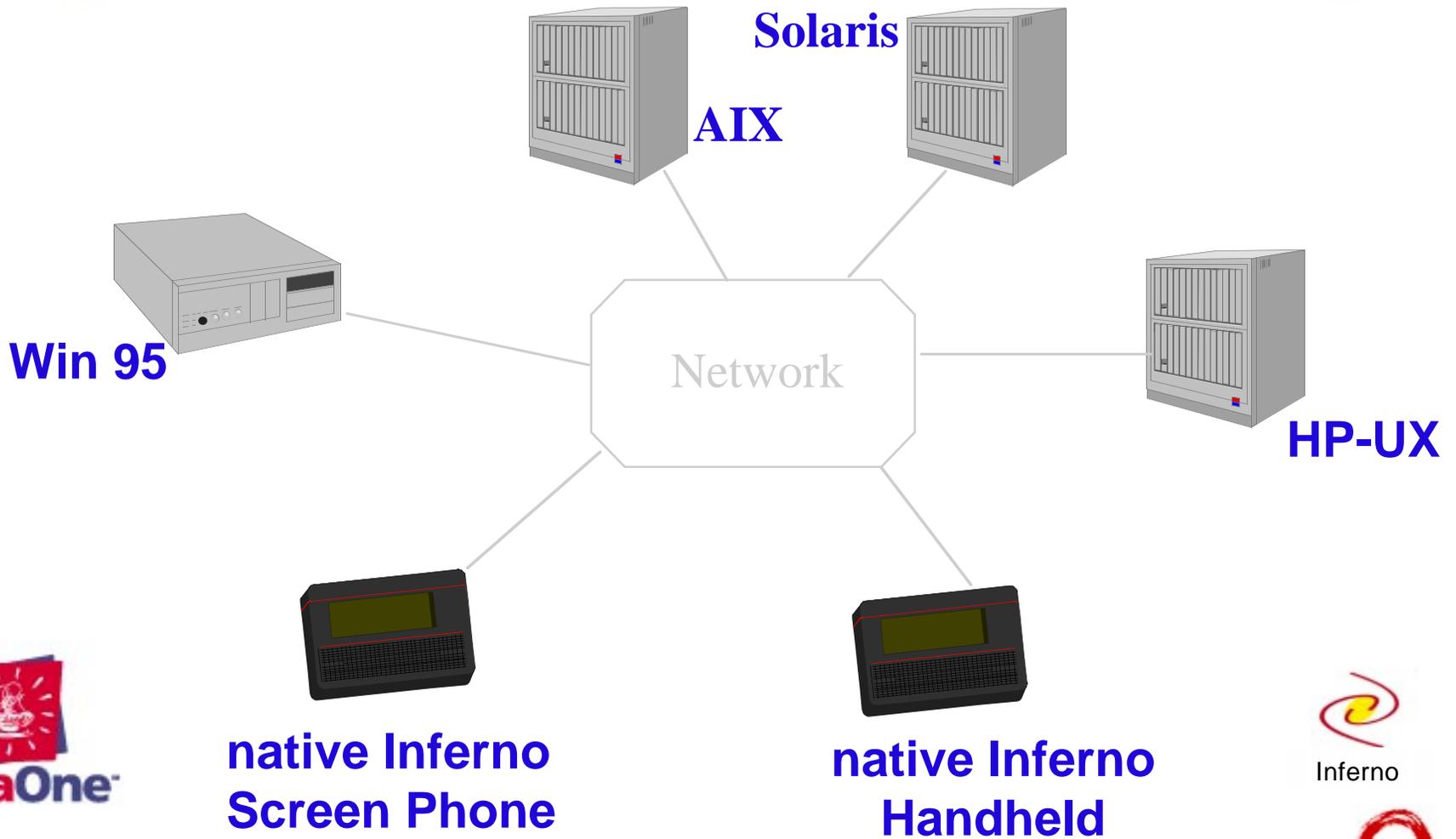


[The Power of the Network at the Client]

- *Server sees client as local*
- *Power of Server is at client*



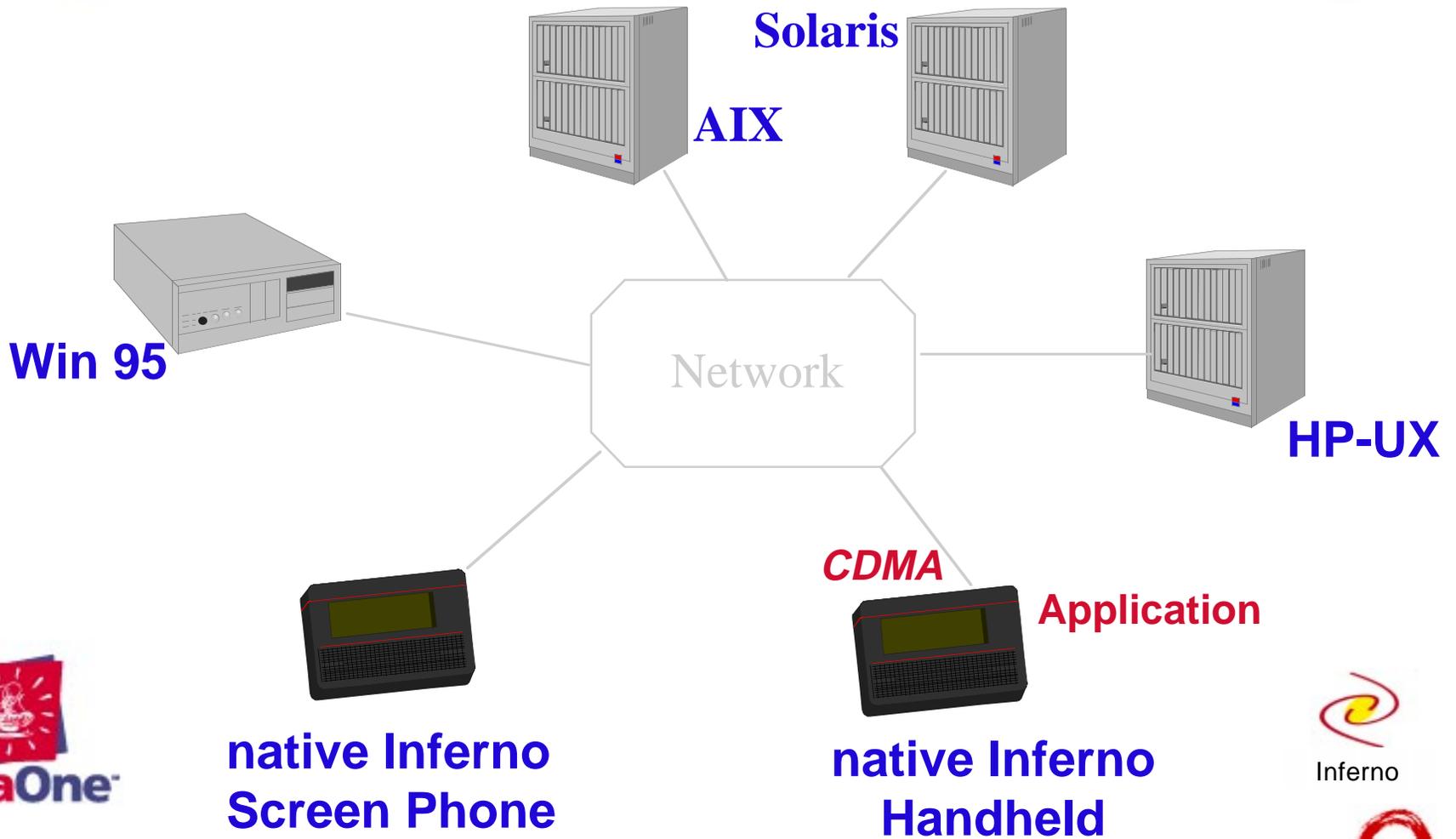
[True Portability Across Operating Environments]



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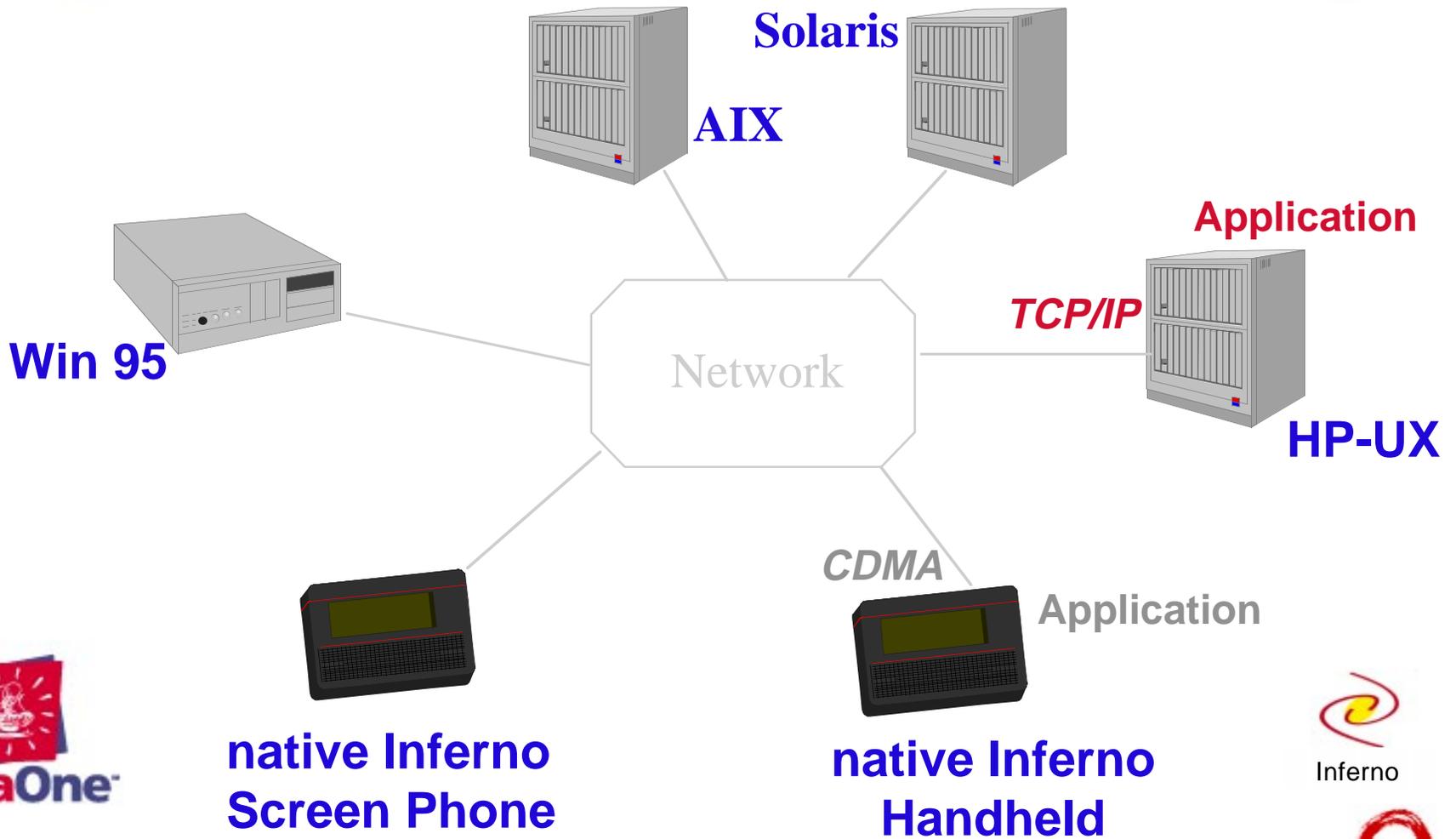
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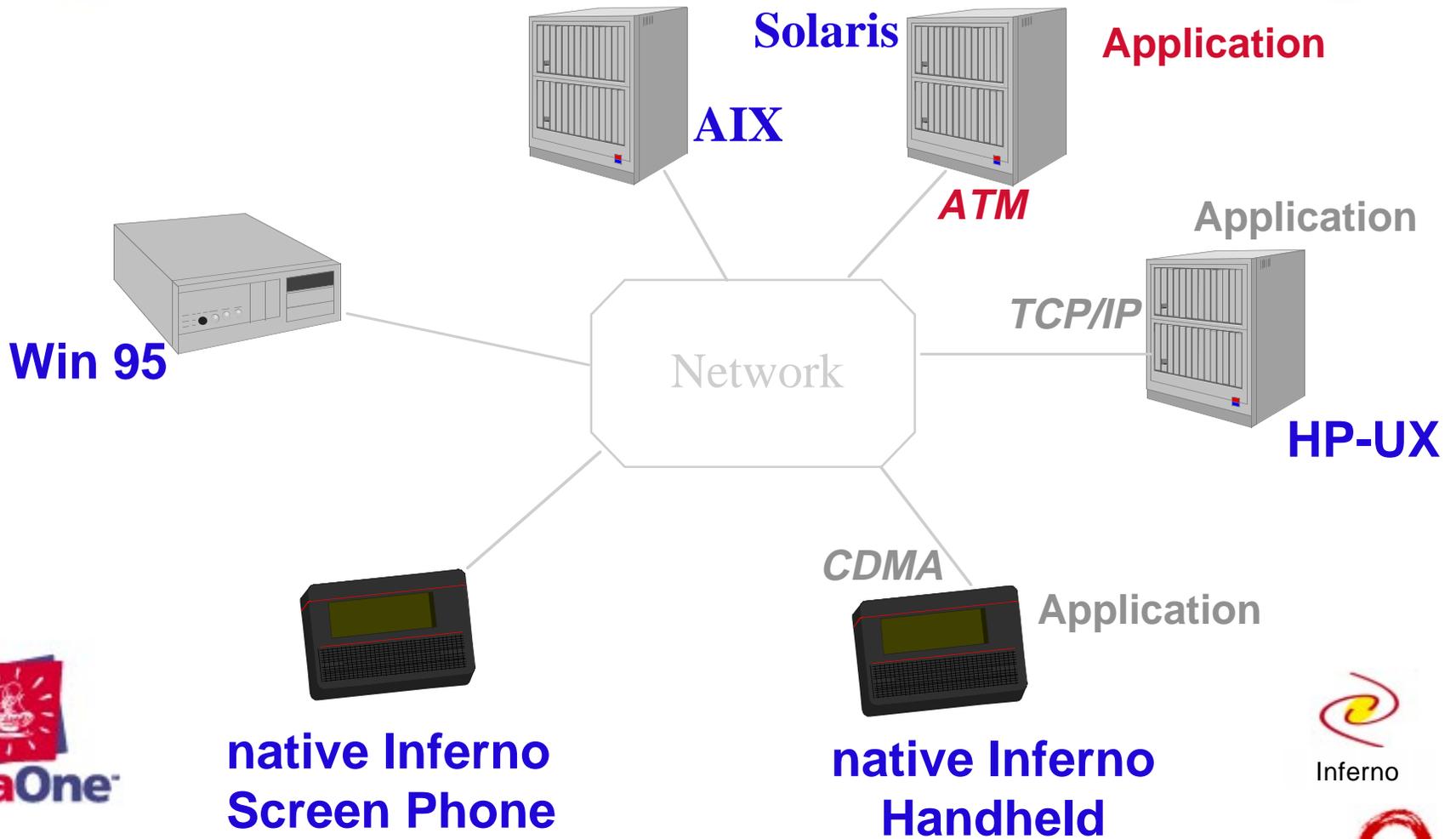
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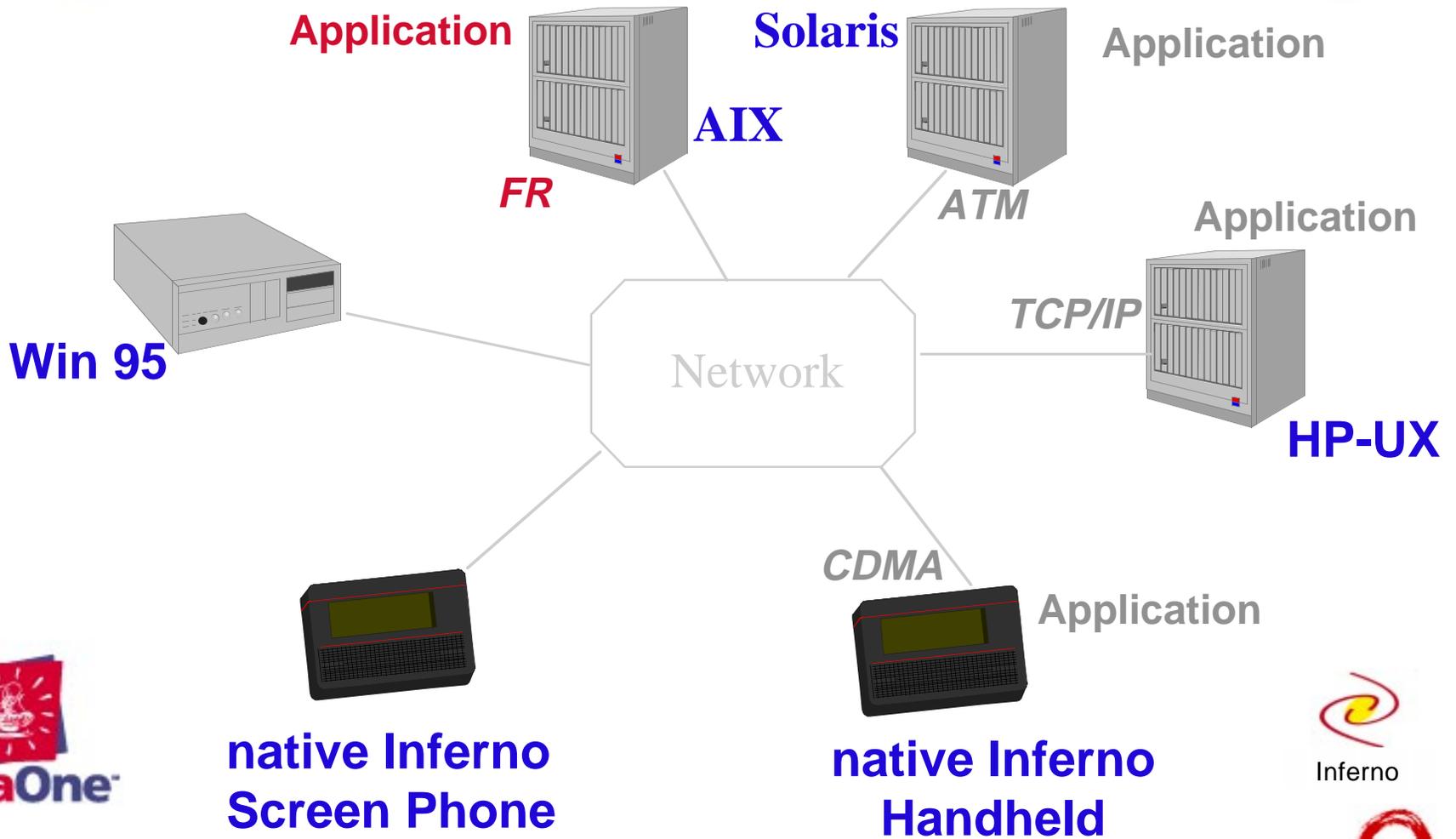
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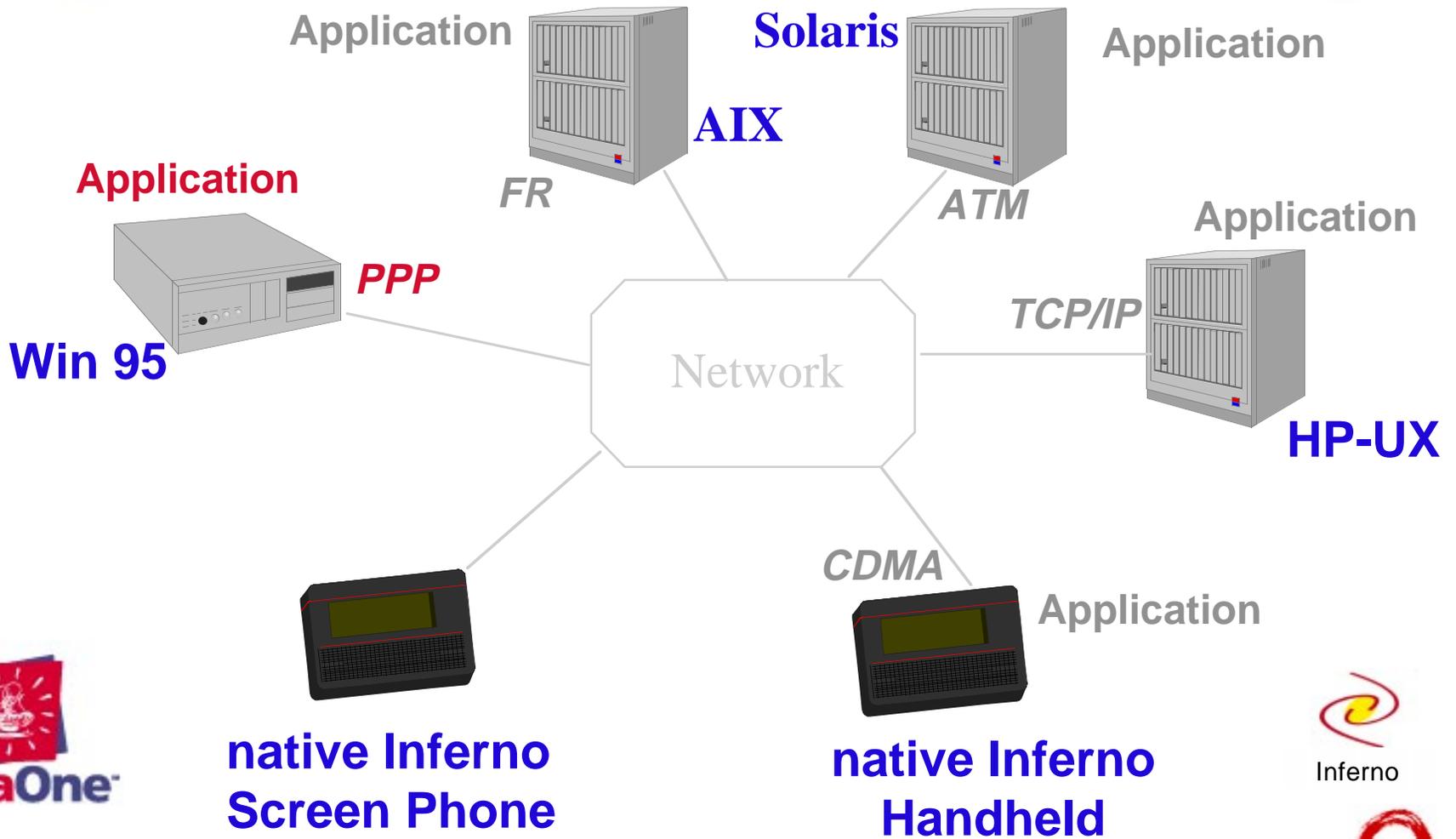
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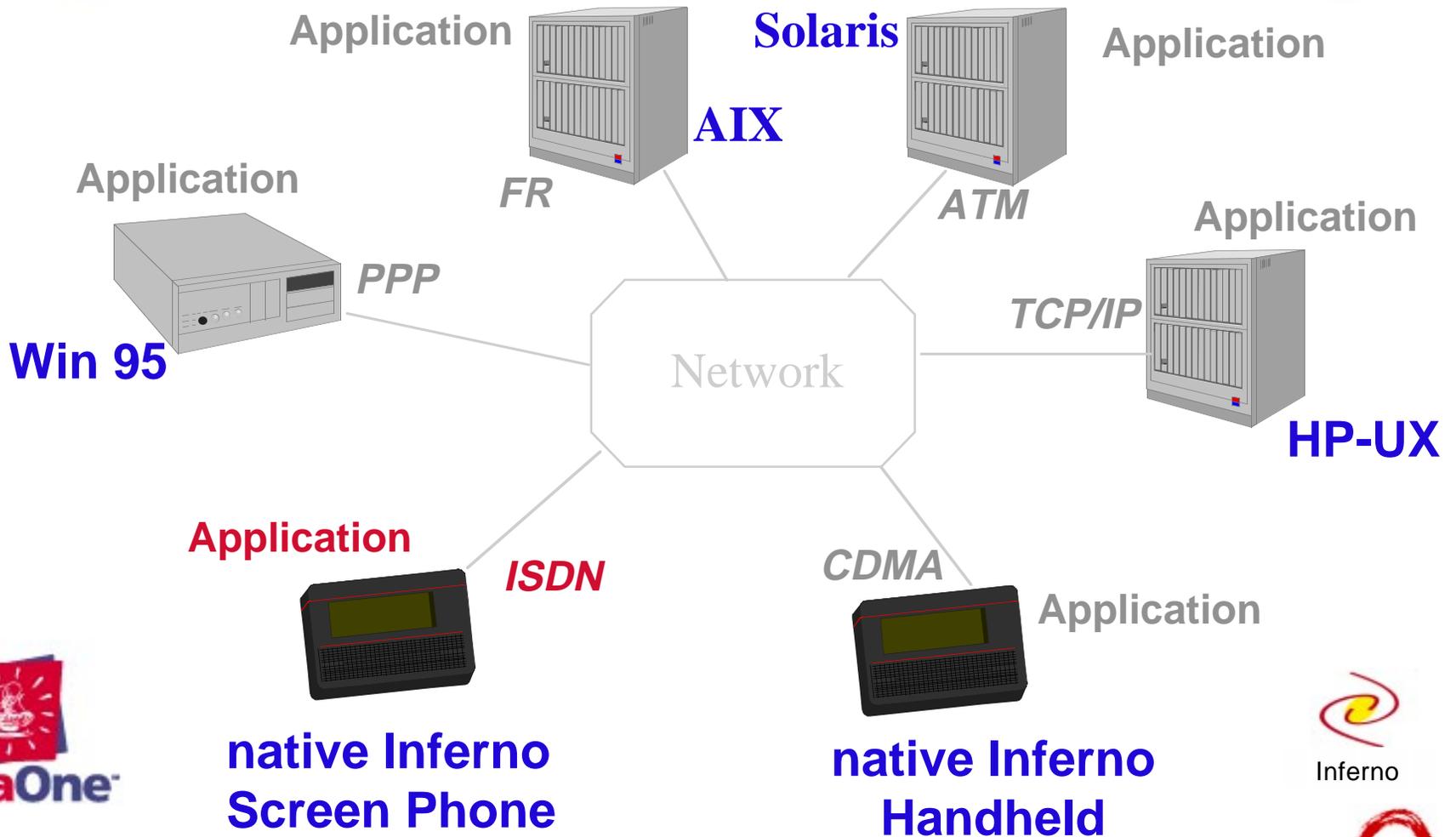
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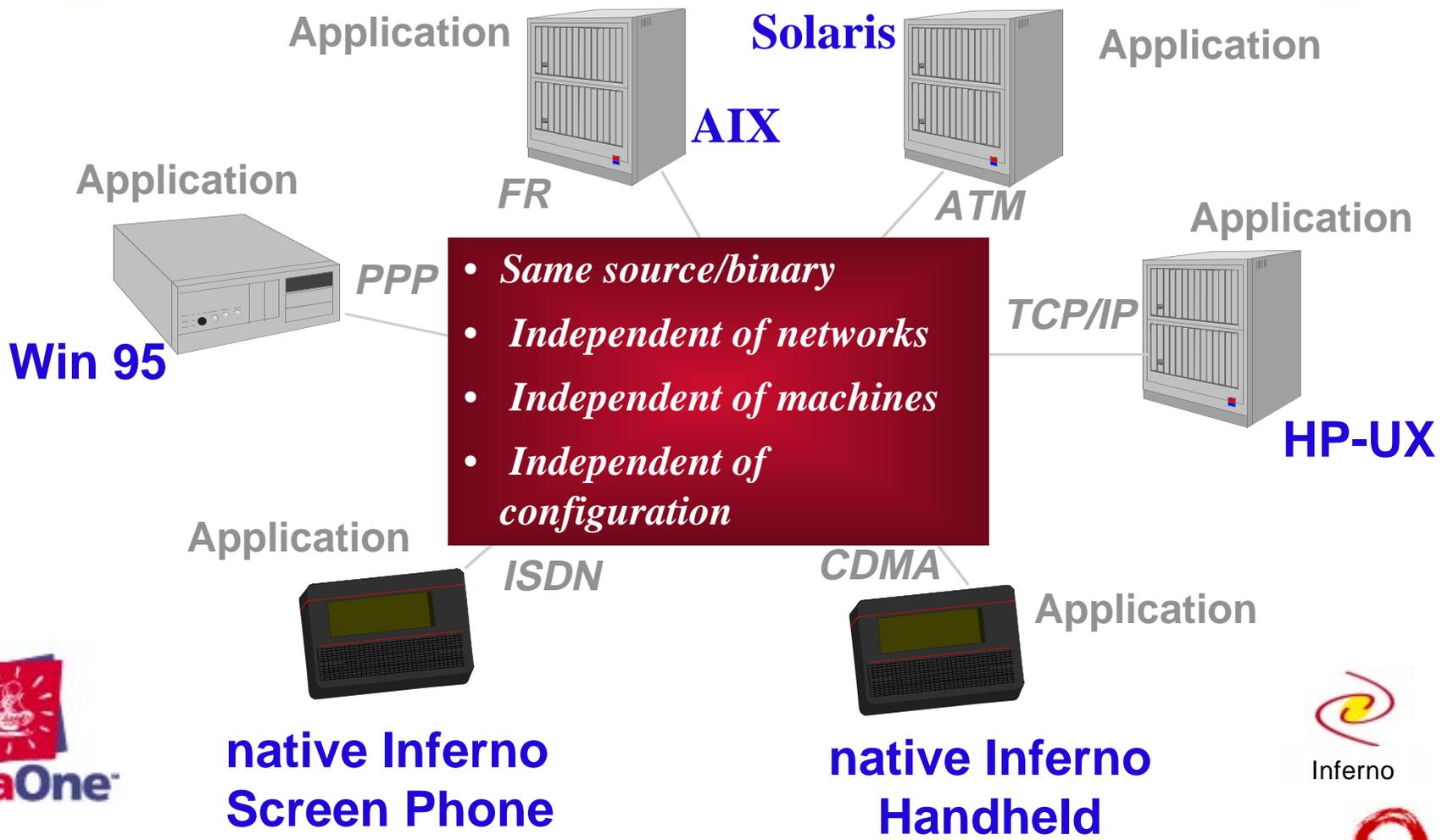
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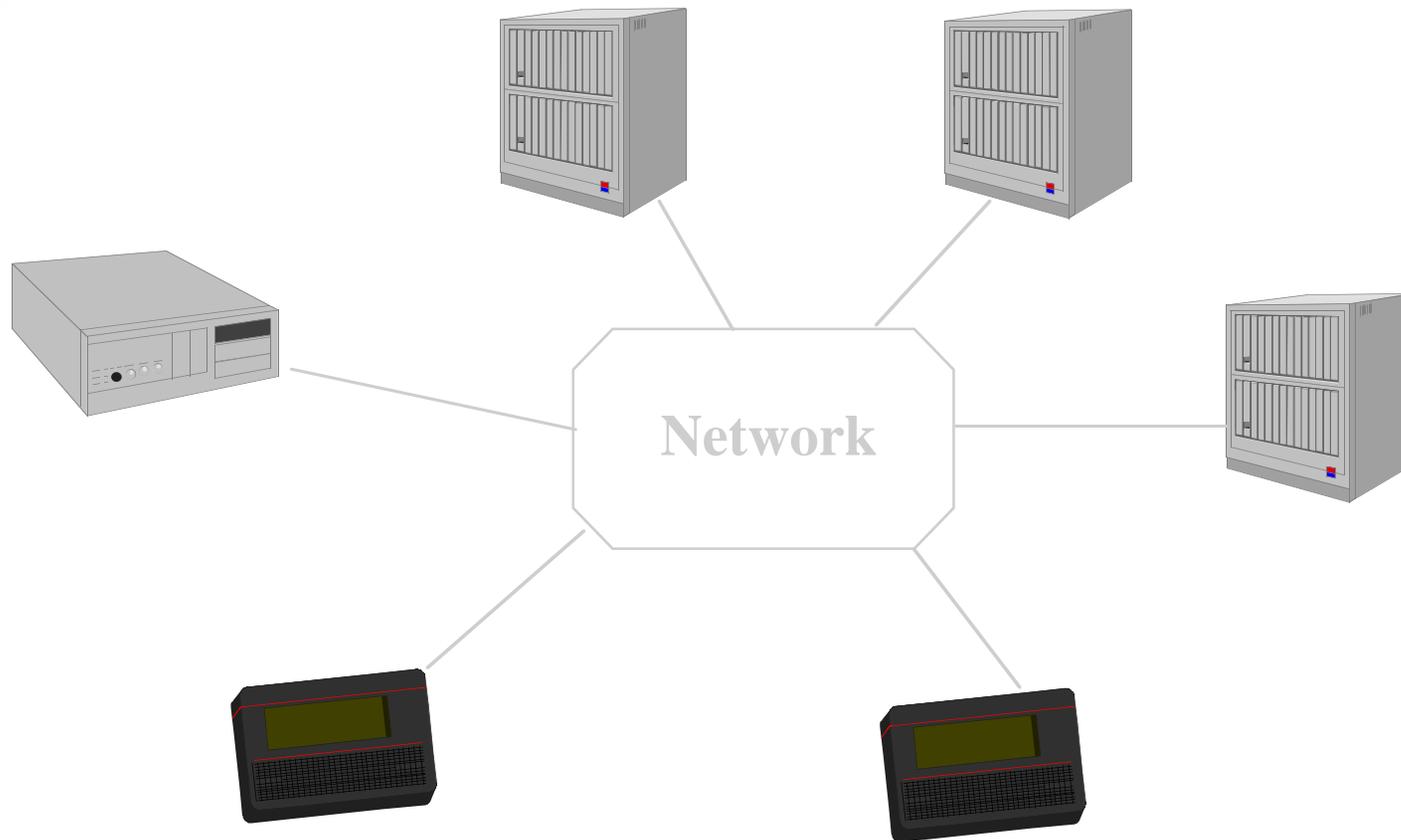
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True Portability Across Operating Environments



Many Paths to Legacy Systems



native
Inferno

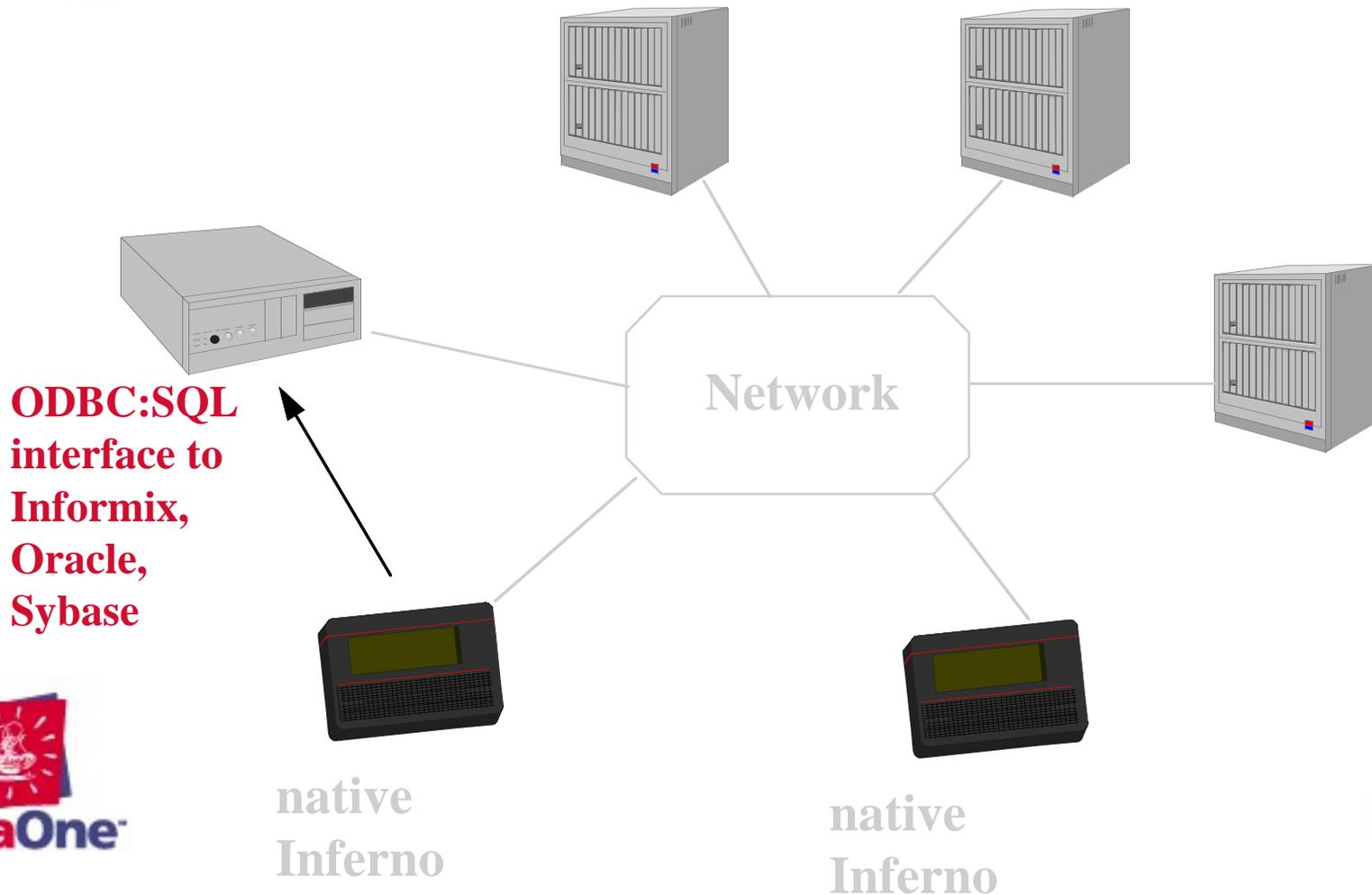
native
Inferno



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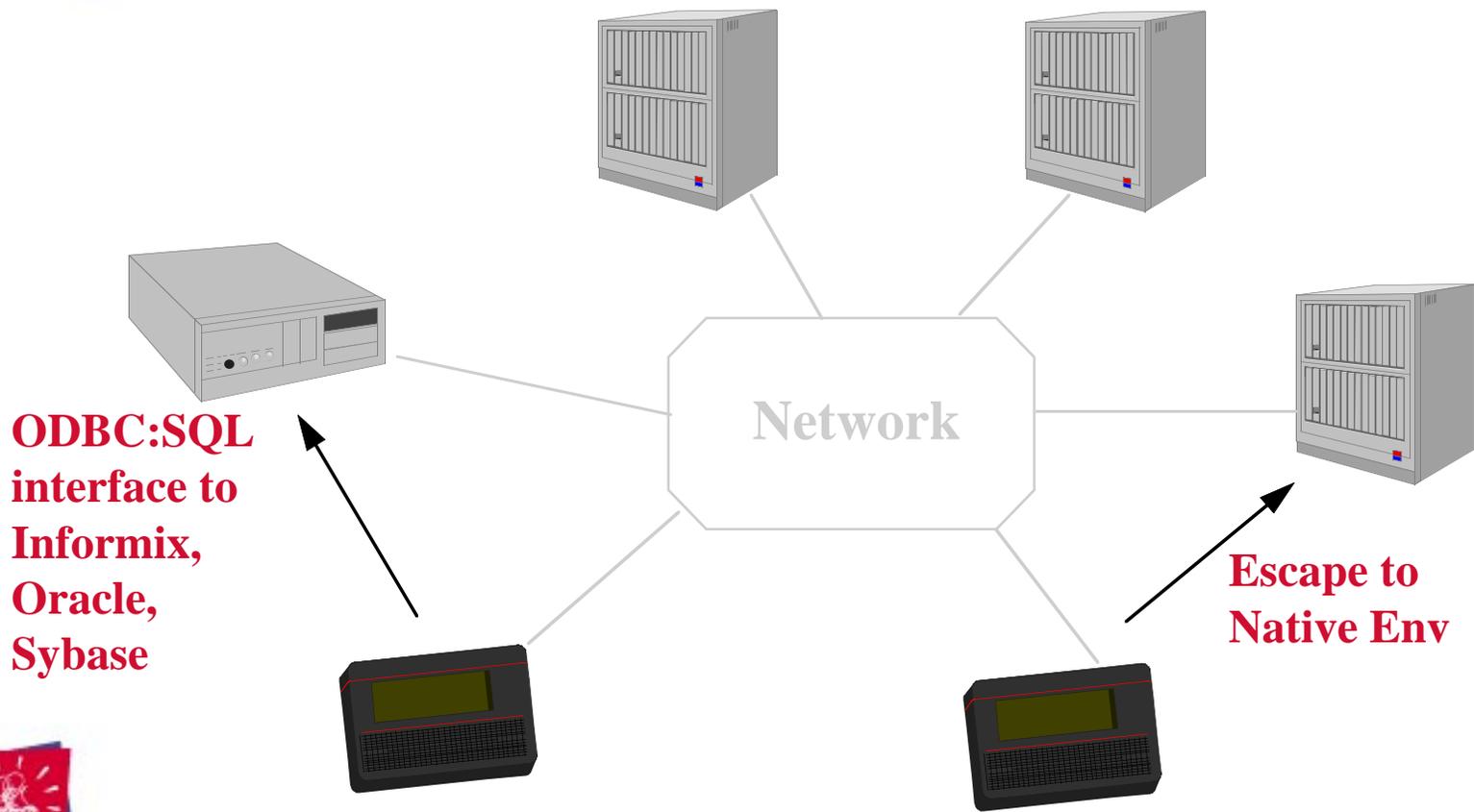
Many Paths to Legacy Systems



<http://www.lucent.com/inferno>



[Many Paths to Legacy Systems]



ODBC:SQL interface to Informix, Oracle, Sybase

Escape to Native Env

native Inferno

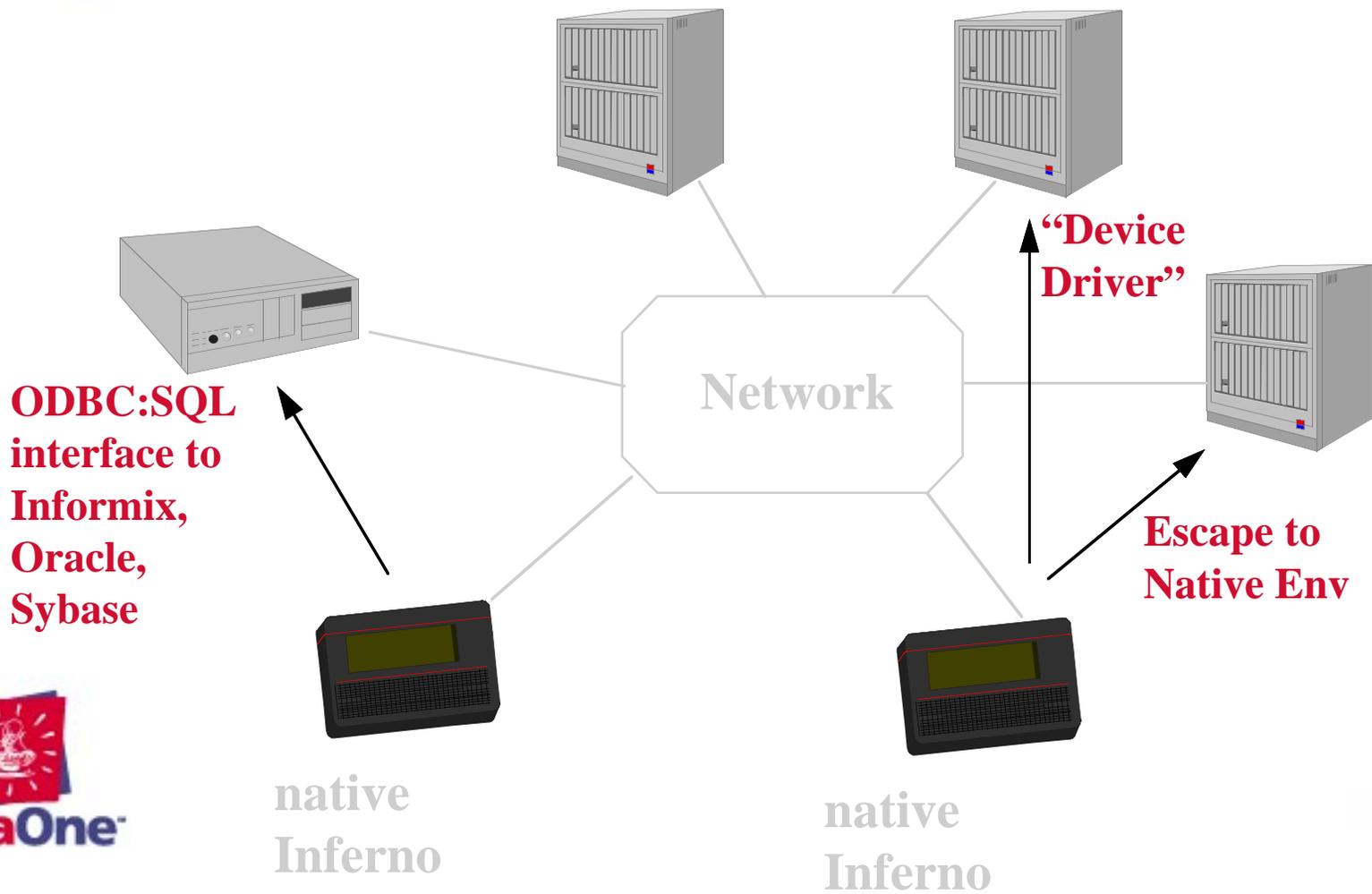
native Inferno



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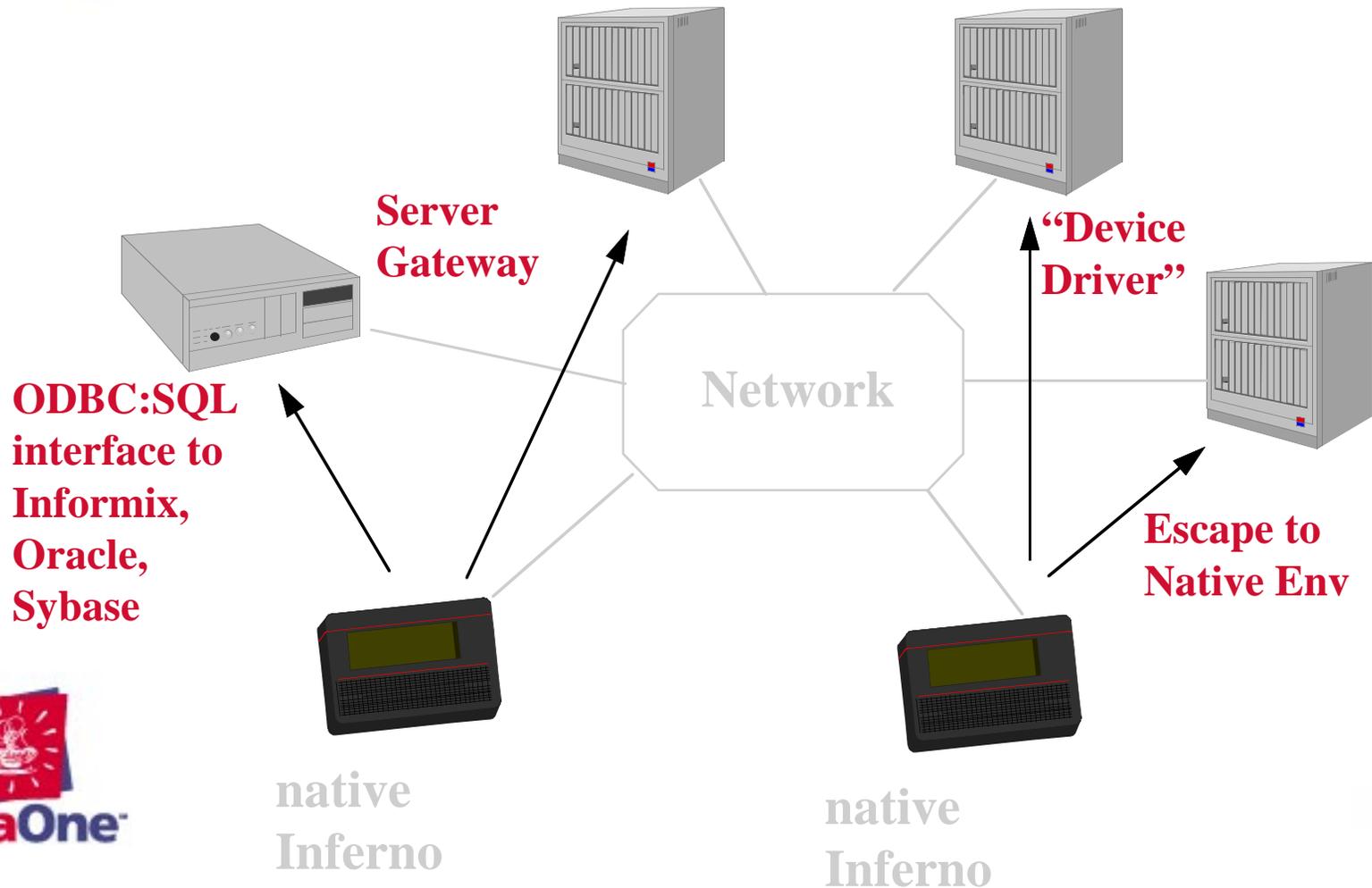
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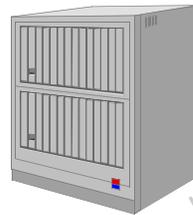


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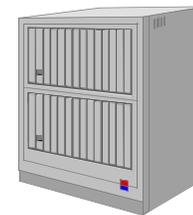


Inferno Networks: Reliable and Manageable

Application 1

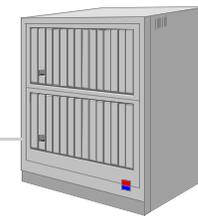


Server1



Server2

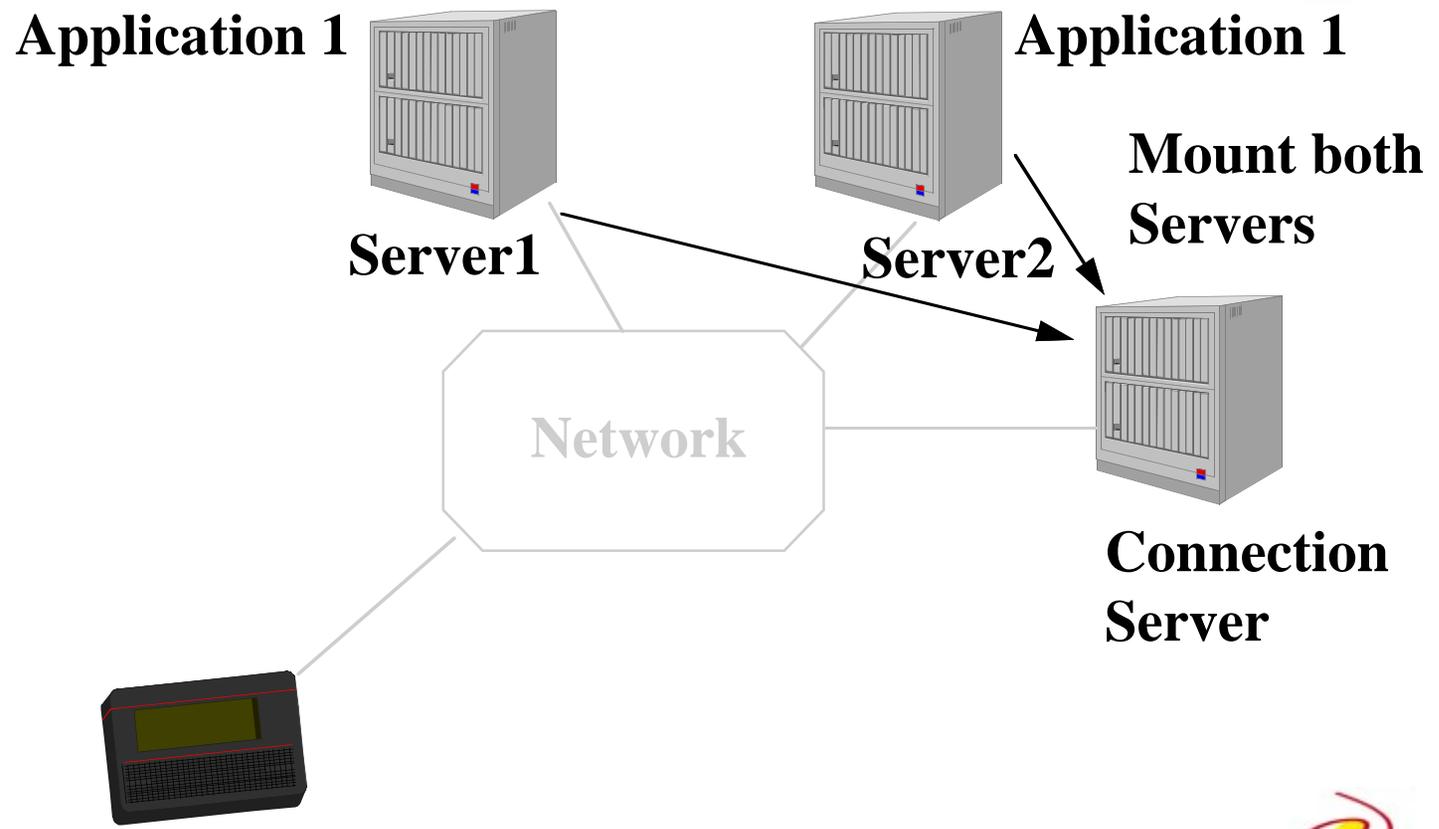
Application 1



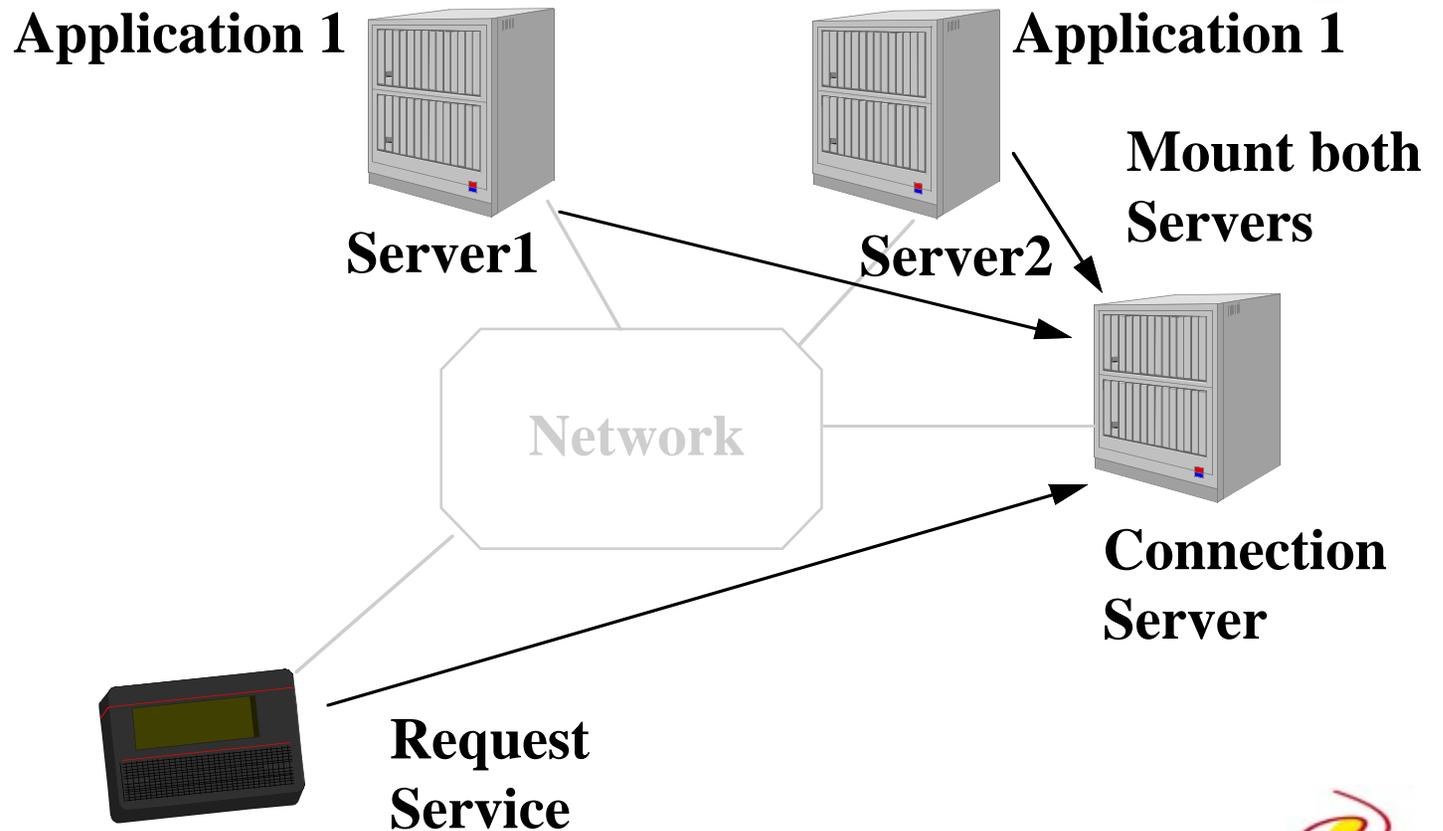
Connection
Server



Inferno Networks: Reliable and Manageable

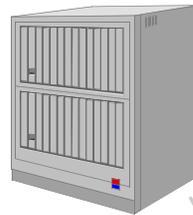


Inferno Networks: Reliable and Manageable

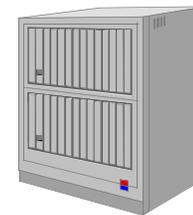


[Inferno Networks: Reliable and Manageable]

Application 1



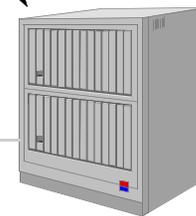
Server1



Server2

Application 1

Mount both
Servers



Connection
Server



JavaOne



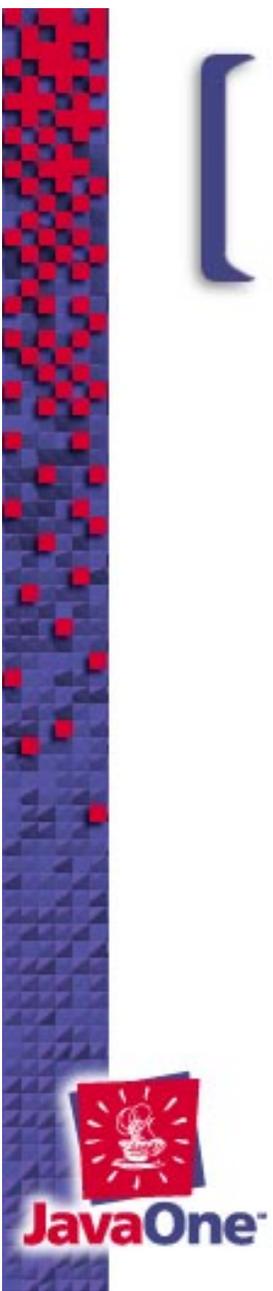
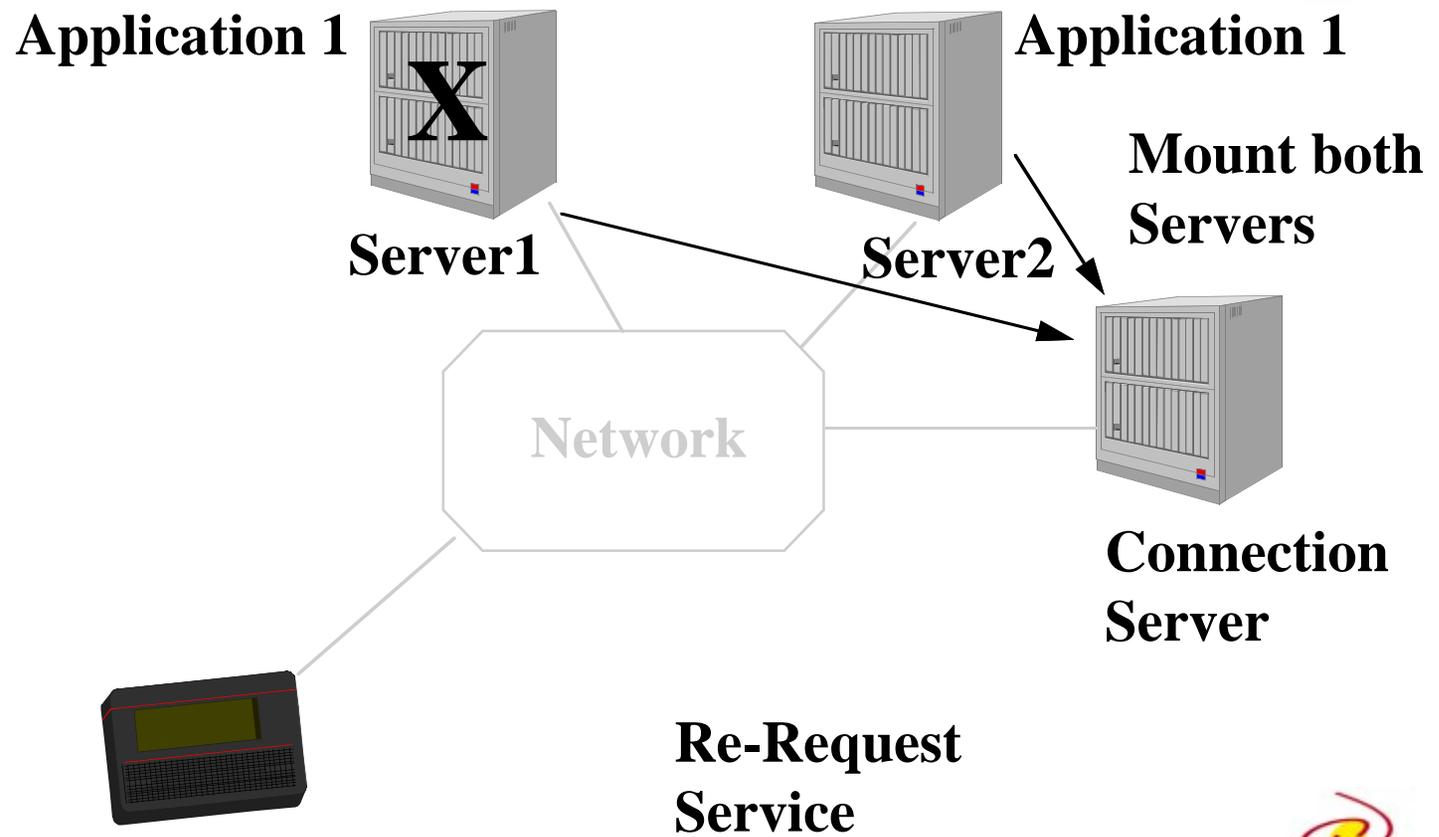
Inferno



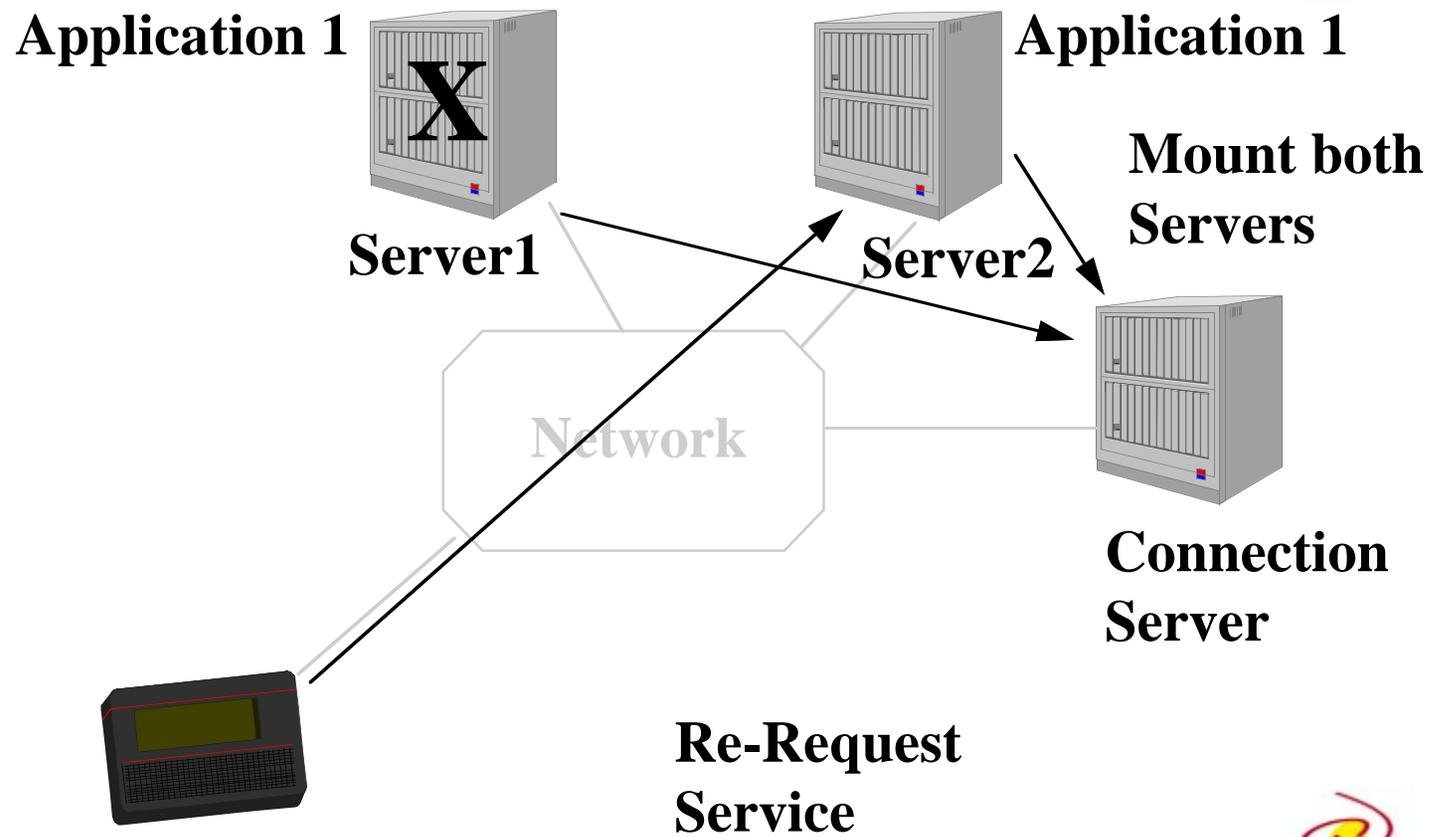
Lucent Technologies
Bell Labs Innovations

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Inferno Networks: Reliable and Manageable



Inferno Networks: Reliable and Manageable



[High Performance]

- ◆ Interpreter is within a factor of 20-30 times compiled C
- ◆ JITs are within a factor of 1.5-2 times compiled C
- ◆ Real-time scheduling and priority mechanisms



[Java Support -- R2.0]

- ◆ Java on all Inferno platforms
- ◆ Interpreters and just-in-time compilers
- ◆ Compact code
- ◆ Access to Inferno namespaces
- ◆ First API: consumer appliance



Inferno Product Plans

- ◆ Java Support: desktop, embedded, JCard API support
- ◆ Personalization applications
- ◆ Data Push application to the home
- ◆ Informix DataBlades
- ◆ SNMP based NM and recovery
- ◆ Extended support for legacy systems



Summary

Inferno

- ◆ Brings network abstraction concepts to the Java language
- ◆ Offers a new level of security
- ◆ Provides distributed computing
- ◆ Enables QoS for thin clients
- ◆ Next generation technology, available today

