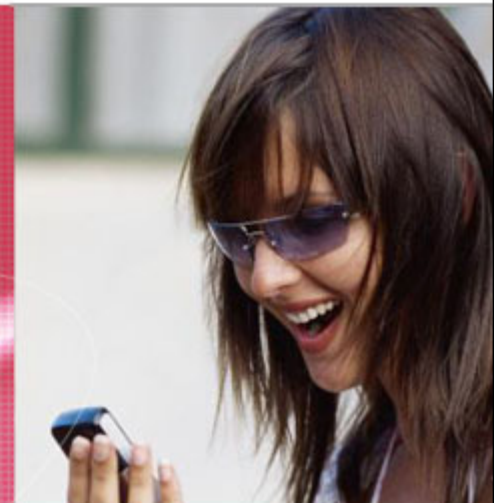


SoftRouter:
An Open Extensible Platform for
Tomorrow's Internet Services



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May 2007

Changing Face of Networking

Trends

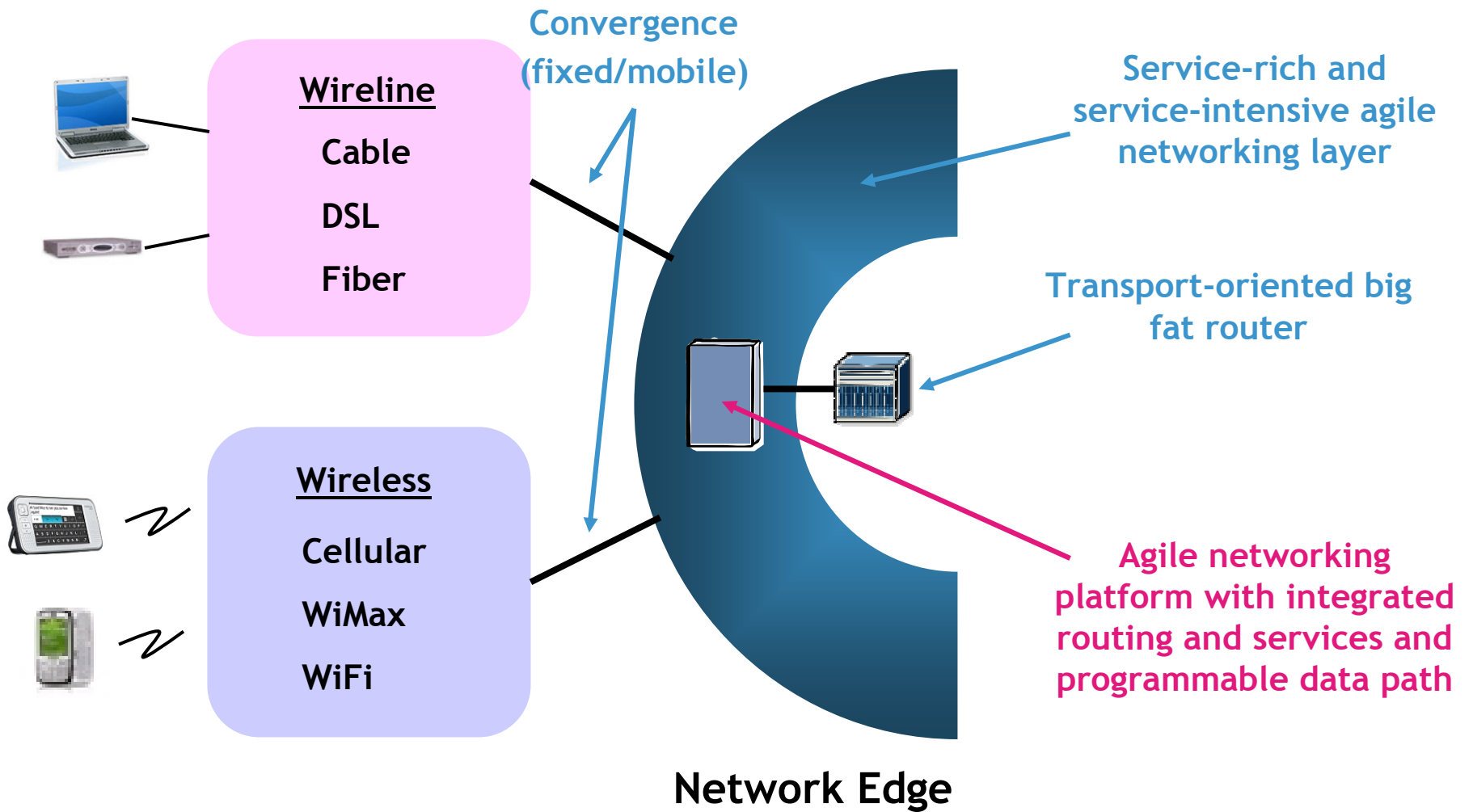
- Network convergence - one shared network for voice, video and data, fixed/mobile convergence
- Exploding variety of end devices - mobiles, set top boxes, sensors
- Applications popularity and mix can change overnight e.g., P2P, internet video) and evolving standards (e.g., LTE, UMB)
- Control, Security, App enhancements are important
 - Control - preference to profitable bits
 - Security - stop bogus bits

Implications

- Carrier grade: predictable quality, availability
 - Network wide objective, virtual circuit, distributed control ?**
- Mid boxes, service rich edge
 - Network-based services**
- Rapidly changing requirements for data path
 - Flexible/reprogrammable data path**
- Network-based packet services are as important as packet transport
 - More than packet forwarding**

Separation of control & forwarding
Integrated routing/switching and services

Agile Networking Layer



Network Element Construction

Commoditization - ride technology curve

- Merchant chips are becoming quite capable
 - Single chip 256G ethernet switch chip, IPsec, Search engine, ...
 - Multicore processors
- Industrial standard chassis becoming available
 - ATCA, blade center
- SW components
 - Linux, DB

Open system - leverage the community

- Ability to add new functionality via well-defined interface post architecture
- Useful internally (feature modularity) and externally (3rd party apps)
- Not same as open source

Programmable components

- Data path can be changed on demand

Multi-function

- Packet processing shares many common functions
- Individual points solutions waste ports, repeat common functions
- Collapse point solutions in a common platform

Virtualization

- Multiple logical network elements in 1 physical element/multiple apps on 1 blade/multiple instance of apps

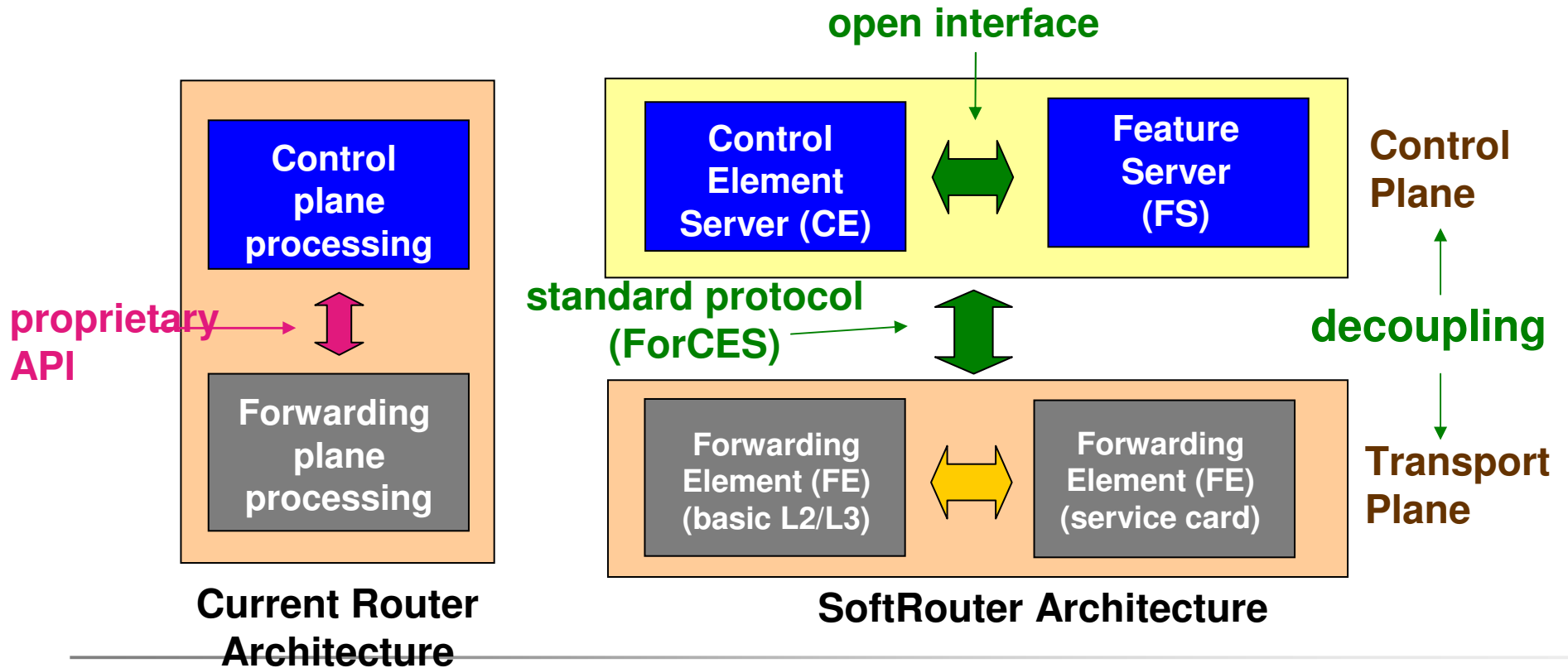
Vision of a network “PC”

SoftRouter Architecture for Agile Networking

First we disaggregate: Decoupling of router Forwarding and Control functions minimizes cost and improves scalability

- Forwarding Elements (FEs) - hardware intensive, commoditized, distributed
- Control Elements (CEs) & Features Servers (FSs) - software intensive, can be centralized

Then we integrate: Open interfaces enable embedding of applications



Examples: Data Path Applications

Policy enforcement

- Firewall
- Traffic conditioner

NAT

Accounting/metering

DPI apps

- App identification
- IDS/IPS

Transcoding

Application acceleration

Examples: Control Path Applications

Custom routing protocol

- Delay-based routing
- Inter-domain QoS routing

Custom protocol processing

- IGMP

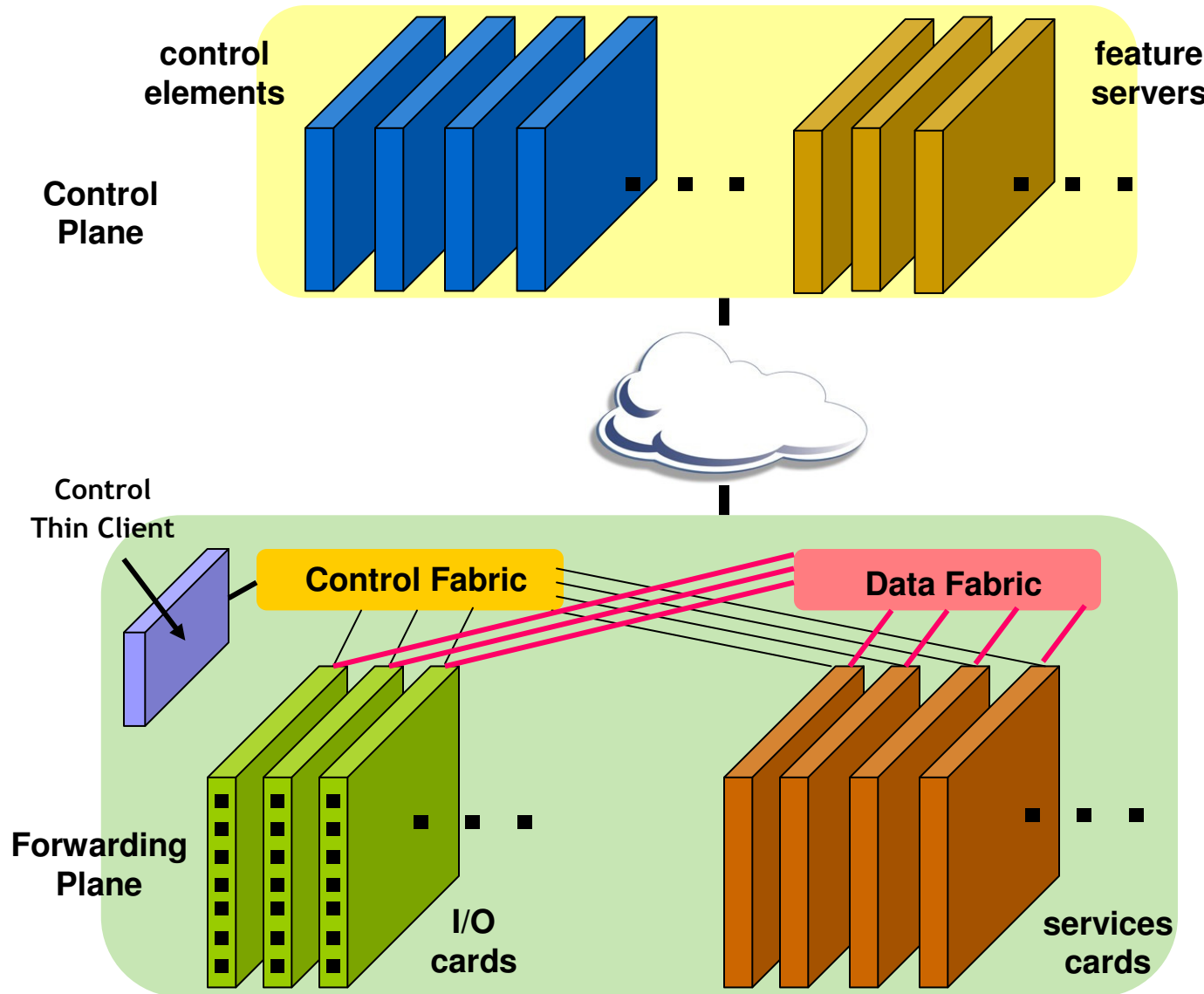
Custom network measurement/probing

- VoIP quality
- SIP signaling

Custom management

- Data aggregation
- Custom data export

Extensible SoftRouter Architecture



- Virtualized control cluster
- Feature servers in sandboxes

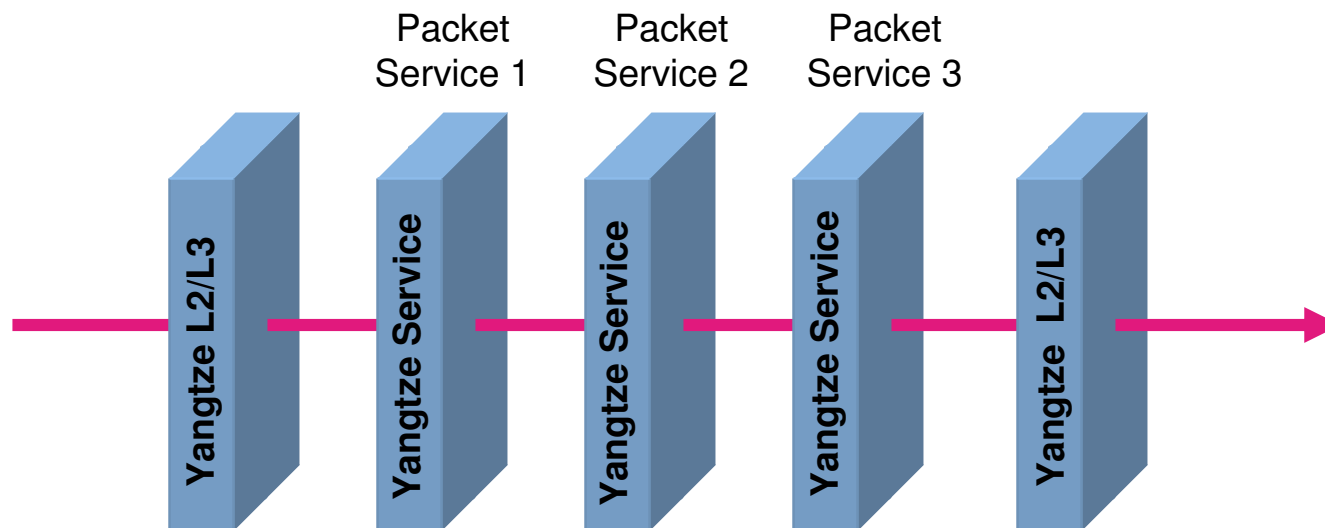
- Programmable services card
- Packet applications loaded dynamically
- Service routing

Service Pipeline: Analog of Unix Pipes

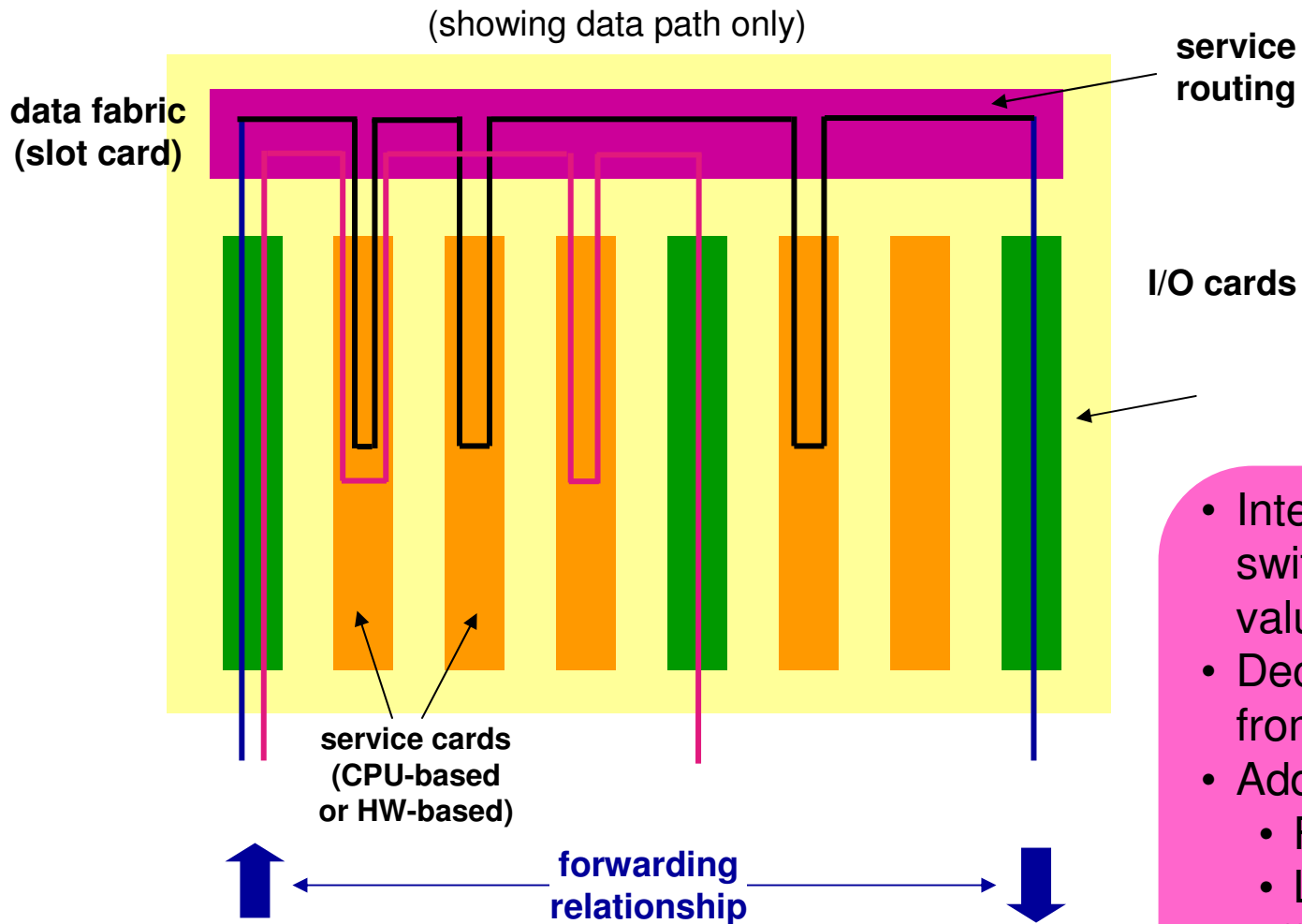
Unix allows processing to be composed via “pipes”

```
cat infile > prog1 | prog2 | prog3 > outfile
```

SoftRouter vision of packet service processing
service cards + service routing = “network pipes”



SoftRouter Data Path Services



- Integrated switching/routing and value-added services
- Decoupling forwarding from service routing
- Additional features
 - Flow replication
 - Load balancing
- Different flows different services

SoftRouter: Data and Control Path Extensibility

