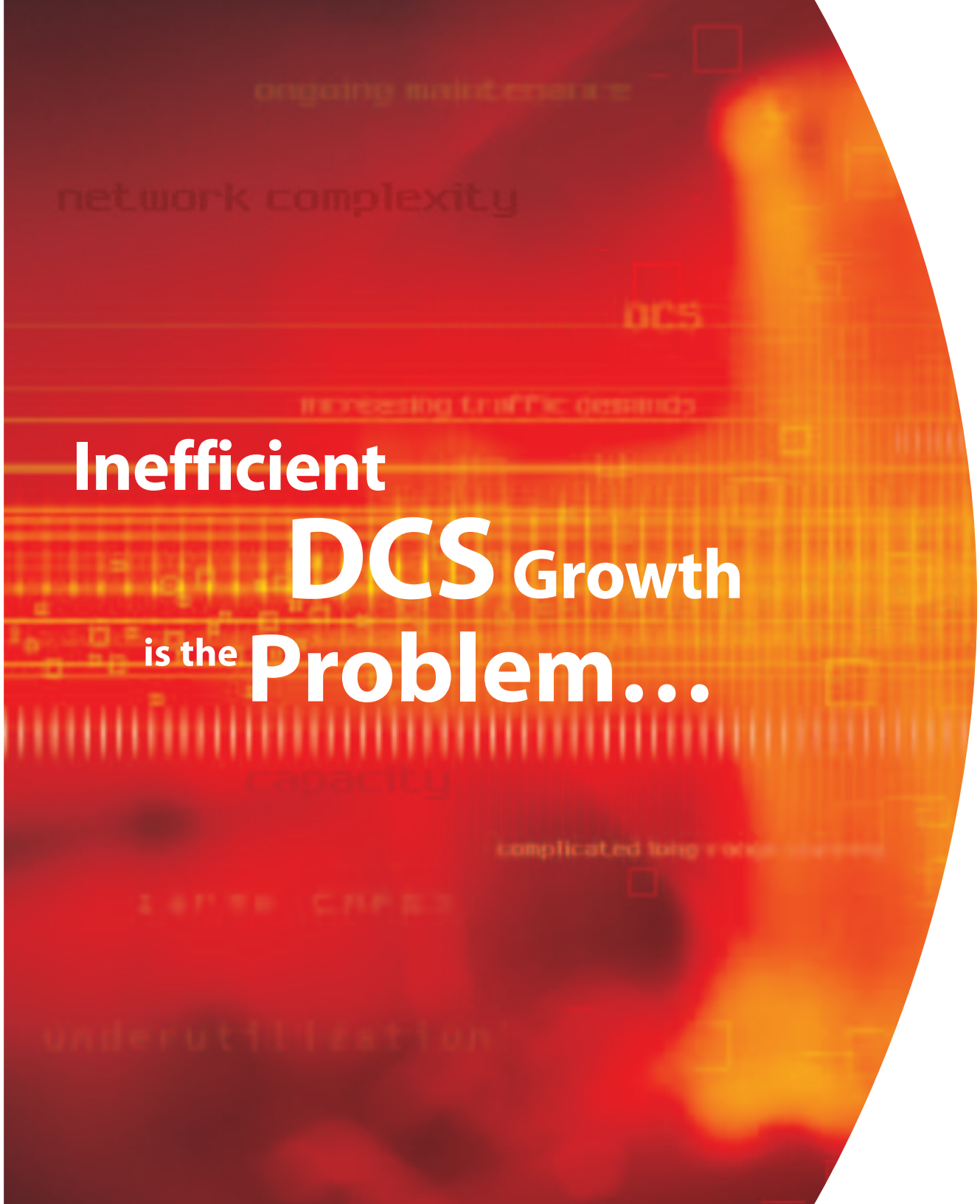
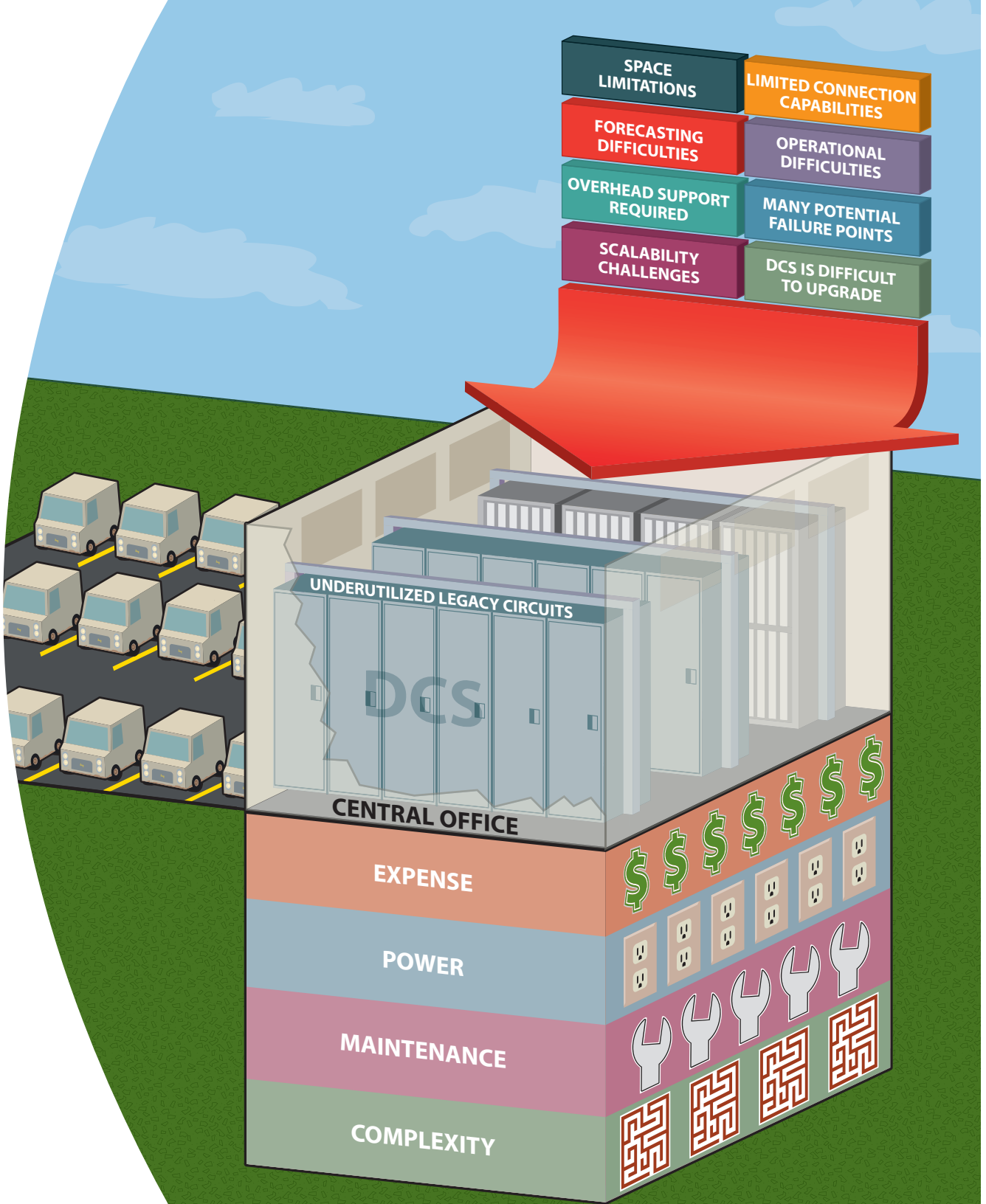
# Scalable Switching Solutions Enabling Carrier-Class Telecom Networks

FLASHWAVE™

FUJITSU

THE POSSIBILITIES ARE INFINITE


ongoing maintenance
network complexity
DCS
increasing traffic demands
Inefficient
DCS Growth
is the Problem…
capacity
complicated long
underutilization


SPACE LIMITATIONS
LIMITED CONNECTION CAPABILITIES
FORECASTING DIFFICULTIES
OPERATIONAL DIFFICULTIES
OVERHEAD SUPPORT REQUIRED
MANY POTENTIAL FAILURE POINTS
SCALABILITY CHALLENGES
DCS IS DIFFICULT TO UPGRADE
UNDERUTILIZED LEGACY CIRCUITS
DCS
CENTRAL OFFICE
EXPENSE
POWER
MAINTENANCE
COMPLEXITY

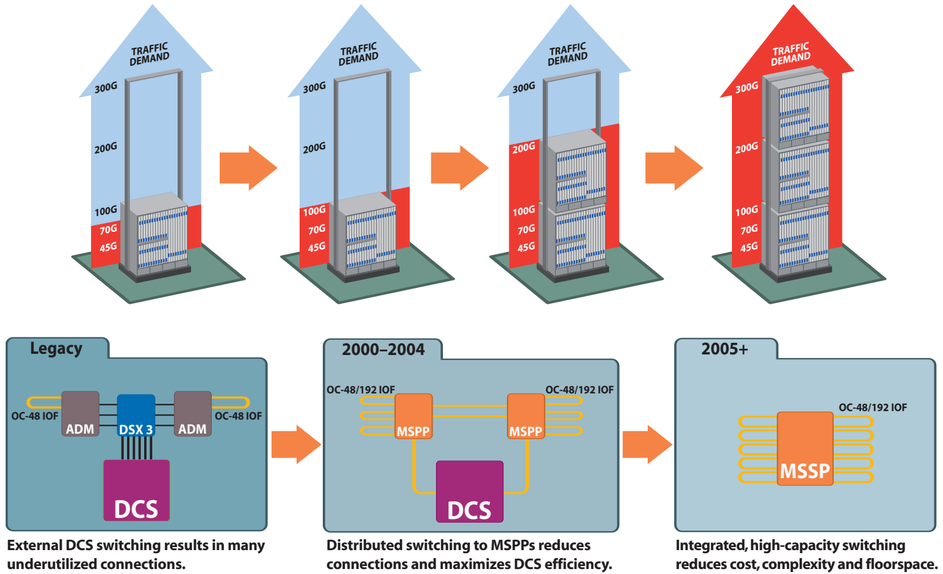
# Legacy DCS Switching Solutions Raise OPERATING COSTS and PLANNING RISKS

Typically located at the busiest Central Office (CO) hubs in a network, the DCS is a large, multirack system capable of grooming substantial amounts of traffic between the access and interoffice network. Given its relative importance, the DCS is typically one of the most expensive devices in a telecom carrier's network.

Unfortunately, carriers cannot always take full advantage of the large CAPEX costs associated with a DCS. The lack of grooming capabilities on legacy Add/Drop Multiplexers (ADMs) means that most circuits entering a DCS are underutilized, wasting power, space and expensive DCS cross-connect capacity. Eventually, all of the ports on the DCS are consumed, leaving no way to connect new services or satisfy additional demand without adding extra capacity, a time-consuming and complex process. Carriers are discovering that growing their DCSs to handle increasing traffic demands is not as easy or cost-effective as initially promised. Frequent software upgrades and ongoing maintenance issues continue to hamper innovation and the delivery of new services.

In addition, legacy DCS equipment cannot cost effectively handle the diverse electrical and optical connections required in a modern network. Optical interfaces in a DCS are costly and come with limitations. Optical interface rates are limited and typically provide TDM-only solutions. DCS deployments require assistance from auxiliary equipment to provide cost-effective, higher bandwidth capable optical rates, including data interfaces such as 10/100Base-T Ethernet. The net effect is increased network complexity and cost.

Finally, the high cost of a DCS makes long-range traffic planning a critical and complicated task. Network planners must determine where they think the largest service growth will occur and forecast switching requirements far into the future. If the DCS is placed in the wrong CO, Interoffice Facility (IOF) costs for moving traffic from where the DCS should be to where it actually is will cause IOF costs and network complexity to quickly skyrocket.




**External DCS switching results in many underutilized connections.**

**Distributed switching to MSPPs reduces connections and maximizes DCS efficiency.**

**Integrated, high-capacity switching reduces cost, complexity and floorspace.**

> **A typical DCS deployment requires carriers to install a completely new Network Element (NE) and incur a significant capital investment, critical long-range planning expense and the overhead of supporting yet another NE.**
>
> **- Dana Cooperson**
> **Group and Program Director, Optical Networking, Ovum-RHK**

> **The Fujitsu FLASHWAVE® 4500 platform is very threatening to competitors because it has been deployed by many carriers, including several RBOCs. The FLASHWAVE 4500 platform has the combination of capacity, optical port density, variety of interface support and Ethernet transport functionality that fits many carrier requirements for metro edge systems.**
>
> **- David Dunphy**
> **Principal Analyst, Current Analysis**

# Multiservice Switching SOLUTIONS Raise Network EFFICIENCY and CUSTOMER SATISFACTION

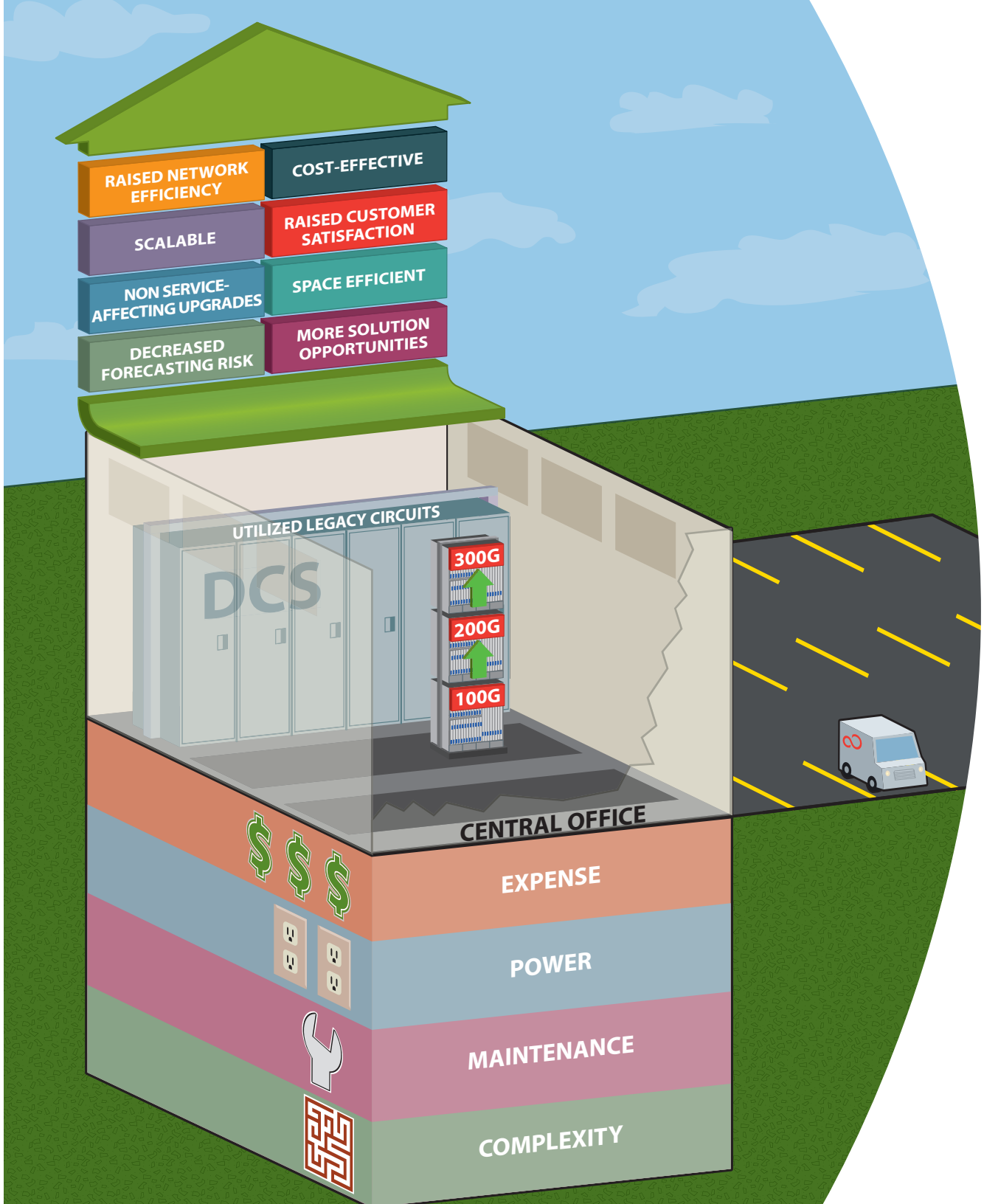
DCS port optimization is one of the key applications for the FLASHWAVE 4500 Multiservice Provisioning Platform (MSPP). With a powerful, centralized STS switch fabric, integrated test access, and full Performance Monitoring (PM) capabilities, the FLASHWAVE 4500 MSPP pre-grooms traffic before it enters the DCS. The platform optimizes DCS port usage, frees up valuable ports for new customer traffic, and allows carriers to extend the life of their existing DCS.

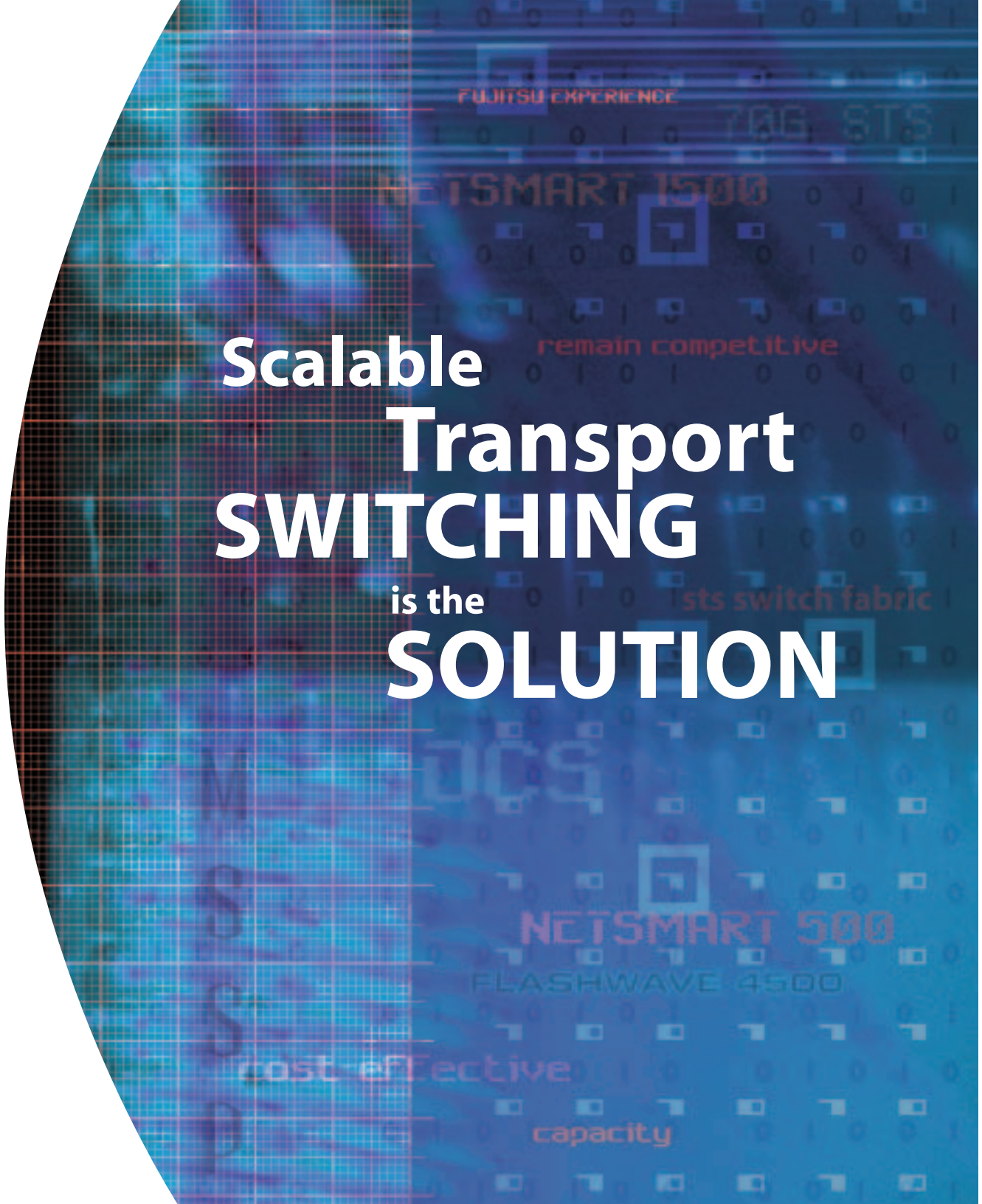
Optimizing port usage can improve efficiency and delay the purchase of a new DCS. However, with continued growth, carriers will eventually need to add another high-capacity grooming device to the network. For these applications, any FLASHWAVE 4500 MSPP in their network can be expanded in-service to become a Multiservice Switching Platform (MSSP) that combines the transport capabilities of an MSPP with the grooming capabilities of a DCS. All incoming access and interoffice rings are terminated directly on the MSSP, which minimizes the number of NEs required, saves space and power, and reduces the associated interconnect cabling that is responsible for the majority of trouble tickets, drastically reducing maintenance time.

The FLASHWAVE 4500 MSSP can be justified for a wide variety of switching requirements in COs of all sizes, matching capital investment with today's traffic demands and minimizing planning risks. Carriers can start with a single-shelf FLASHWAVE 4500 MSPP configuration with a 45G or 70G STS switch fabric and 20 interface slots to meet the traffic demands in smaller COs. Later, when traffic demand grows, the MSSP switch fabric can be added to allow a single shelf to offer 100G service capacity across its 20 interface slots. When additional interface capacity is required, a second and third shelf can be added to expand the system to 40 interfaces/200G capacity and 60 interfaces/300G capacity. Three shelves can fit in a single rack and all upgrades are non-service-affecting, making this MSSP the easiest multishelf architecture upgrade available.

Complemented by the NETSMART® 500 craft user interface or NETSMART 1500 Element Management System (EMS), the FLASHWAVE 4500 platform makes scalable switching simple and cost-effective for dynamic telecom networks.

> **As the leader in the North American SONET market with a 28% share (per our research), Fujitsu has provided carriers with an alternative to the DCS that allows grooming capacity to be added as needed, lowering short-term Capital Expense (CAPEX) and risk.**
>
> **- Dana Cooperson**
> **Group and Program Director, Optical Networking, Ovum-RHK**


RAISED NETWORK EFFICIENCY
COST-EFFECTIVE
SCALABLE
RAISED CUSTOMER SATISFACTION
NON SERVICE-AFFECTING UPGRADES
SPACE EFFICIENT
DECREASED FORECASTING RISK
MORE SOLUTION OPPORTUNITIES
UTILIZED LEGACY CIRCUITS
DCS
300G
200G
100G
CENTRAL OFFICE
EXPENSE
POWER
MAINTENANCE
COMPLEXITY

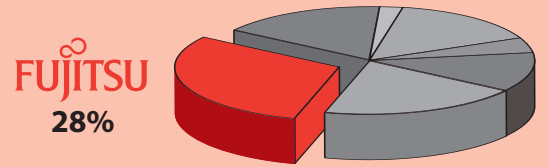



# Scalable Transport SWITCHING is the SOLUTION

## Partner with an Industry Leader

Telecommunications carriers around the world have trusted Fujitsu with their critical optical networking requirements for over 20 years. With more than 320,000 network elements deployed, Fujitsu equipment sets the standard for performance, reliability and carrier-grade quality. Our experience in building robust and scalable networks of all sizes for every major wireline carrier in North America puts Fujitsu in a unique position to help you create networking solutions that are optimized for a wide variety of situations.

**Fujitsu is the Leader of the $1.39 Billion SONET Aggregation Equipment Market in North America**




Source: RHK 2005

The FLASHWAVE 4500 MSPP offers an extremely cost- and space-effective solution for all traditional SONET Add/Drop Multiplexer (ADM) applications, and supports advanced functionality such as STS and VT1.5 switching, native Ethernet transport, digital video transport, and integrated DS3 Transmux.

You can easily expand any FLASHWAVE 4500 MSPP within your network to become an MSSP that supports ultra high-capacity grooming applications that previously required an expensive Digital Cross-connect System (DCS). Both configurations share a common set of shelves, management units, service interfaces, and cabling to minimize the impact on existing operating systems, procedures and staff.

With 20 flexible service interface slots in the MSPP configuration and up to 60 service interface slots in the MSSP configuration, the FLASHWAVE 4500 platform supports dozens of terminal, linear and ring architectures simultaneously, while integrating DWDM, broadband video, and the Local Area Network (LAN) into the backbone network.

In addition, the FLASHWAVE 4500 platform eliminates your dependence on old, asynchronous, stand-alone M13 multiplexers and their associated maintenance-intensive, manual patch panel connections, providing significant reductions in operating expenses.

From wireline to wireless, telecom to cable TV, and all points in between, carriers have standardized on the FLASHWAVE 4500 platform for their mission-critical transport and switching needs.

**Switching Capacity**

| Specification | MSPP | Single Stage MSSP | Double Stage MSSP | Triple Stage MSSP |
|---|---|---|---|---|
| Interface Capacity | 70 Gbps | 100 Gbps | 200 Gbps | 300 Gbps |
| STS-1 Cross-Connects | 1344 x 1344 (70 Gbps) | 5760 x 5760 (300 Gbps) | 5760 x 5760 (300 Gbps) | 5760 x 5760 (300 Gbps) |
| VT1.5 Cross-Connects | 5376 x 5376 (10 Gbps) | 10,752 x 10,752 (20 Gbps) | 10,752 x 10,752 (20 Gbps) | 10,752 x 10,752 (20 Gbps) |

**Maximum Number of Unprotected (Protected) Service Interfaces**

| Type | Ports/ Card | MSPP | Single Stage MSSP | Double Stage MSSP | Triple Stage MSSP |
|---|---|---|---|---|---|
| DS1 (Integrated) | 28 | 84 (84) | 84 (84) | 168 (168) | 252 (252) |
| DS1 (High-Density) | 168* | 6720 | 6720 | 13,440 | 20,160 |
| DS3/EC1 | 8 | 96 (96) | 96 (96) | 192 (192) | 288 (288) |
| DS3 Transmux | 12 | 144 | 144 | 288 | 432 |
| OC-3/3c/STM-1 | 4 | 80 (40) | 80 (40) | 160 (80) | 240 (120) |
| OC-12/12c/STM-4 | 4 | 80 (40) | 80 (40) | 160 (80) | 240 (120) |
| OC-48/48c/STM-16 | 2 | 40 (20) | 40 (20) | 80 (40) | 120 (60) |
| OC-192/192c/STM-64 | 1 | 4 (2) | 10 (5) | 20 (10) | 30 (15) |
| 10/100Base-T Ethernet | 8 | 80 | 80 | 160 | 240 |
| Gigabit Ethernet | 2 | 40 | 40 | 80 | 120 |
| DVB-ASI | 8 | 40 | 40 | 80 | 120 |

* Note: Total number of DS1s per high-density interface

**Fujitsu Network Communications Inc.**
2801 Telecom Parkway, Richardson, TX 75082
Tel: 800.777.FAST Fax: 972.479.6900
us.fujitsu.com/telecom