

RADIO FREQUENCY SYSTEMS



# Innovative Wireless Infrastructure Solutions

Microkit 9<sup>th</sup> Edition



**WIRELESS / MICROWAVE / INDOOR / BROADCAST**

RFS is a worldwide leading provider of innovative wireless and broadcast infrastructure products and solutions

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# Company Profile

RFS is a worldwide leading provider of innovative wireless and broadcast infrastructure products and solutions

RFS serves OEMs, distributors, systems integrators, operators and installers in the broadcast, wireless communications, land-mobile and microwave market sectors.

As an ISO 9001 & 14001 compliant organization with manufacturing and customer service facilities that span the globe, RFS offers cutting-edge engineering capabilities, superior field support and innovative product design.

RFS is committed to fulfilling the most demanding worldwide environmental protection directives and to integrating green initiatives in all aspects of its business.

A blue wireframe illustration of a city skyline with various skyscrapers and a central tower, overlaid on a dark semi-transparent rectangular box.

**RFS is a worldwide leading provider of innovative wireless and broadcast infrastructure products and solutions**

# Key Customers

**The following companies are examples of our key customers**

Alcatel-Lucent  
America Móvil  
AT&T  
Aviat Networks  
Broadcast Australia  
China Mobile  
China Unicom  
CMC  
Ceragon  
E-Plus  
Datang  
Ericsson  
Huawei  
Intracom

KPN  
Megafon  
Motorola  
MTS  
NEC  
Nokia Siemens Networks  
Orange  
Orascom  
Reliance  
SingTel  
Oi  
Ooredoo  
Optus  
SIAE

Softbank Mobile  
Sprint  
T-Mobile  
Telefónica Móviles  
TeliaSonera  
Telstra  
TIM  
Taiwan Mobile  
Toshiba  
TV Globo  
Verizon Wireless  
Vivo  
Zain

**RFS - Global presence with global customers who are major players**



# RFS Global Solutions



Wireless ■ Microwave ■ Indoor ■ Broadcast

**RFS** provides scalable, flexible, future proof and lightweight end-to-end solutions that are optimized across the entire RF chain.

## Worldwide Presence

- 6 manufacturing centers of excellence (Germany, France, USA, Brazil, China and Australia)
- A manufacturing partner in Kolkata, India
- Represented on 6 continents and 20 countries
- 35 technical support and sales offices

## Innovative Solutions

- At the forefront of RF technology
- Proven quality and reliability
- Renowned technical leader for more than half a century

## Evolutionary Solutions

- Scalable and flexible
- Future-proof
- Reliable
- Optimized end-to-end

**True value throughout the complete life cycle, guaranteeing maximum return on investment**



# RFS Application Domains

Cables • Antennas • Tower Systems • Active and passive RF conditioning modules



S O L U T I O N S   F O R   T H E   E N T I R E  
R F   C H A I N



Cellular sites



Microwave links



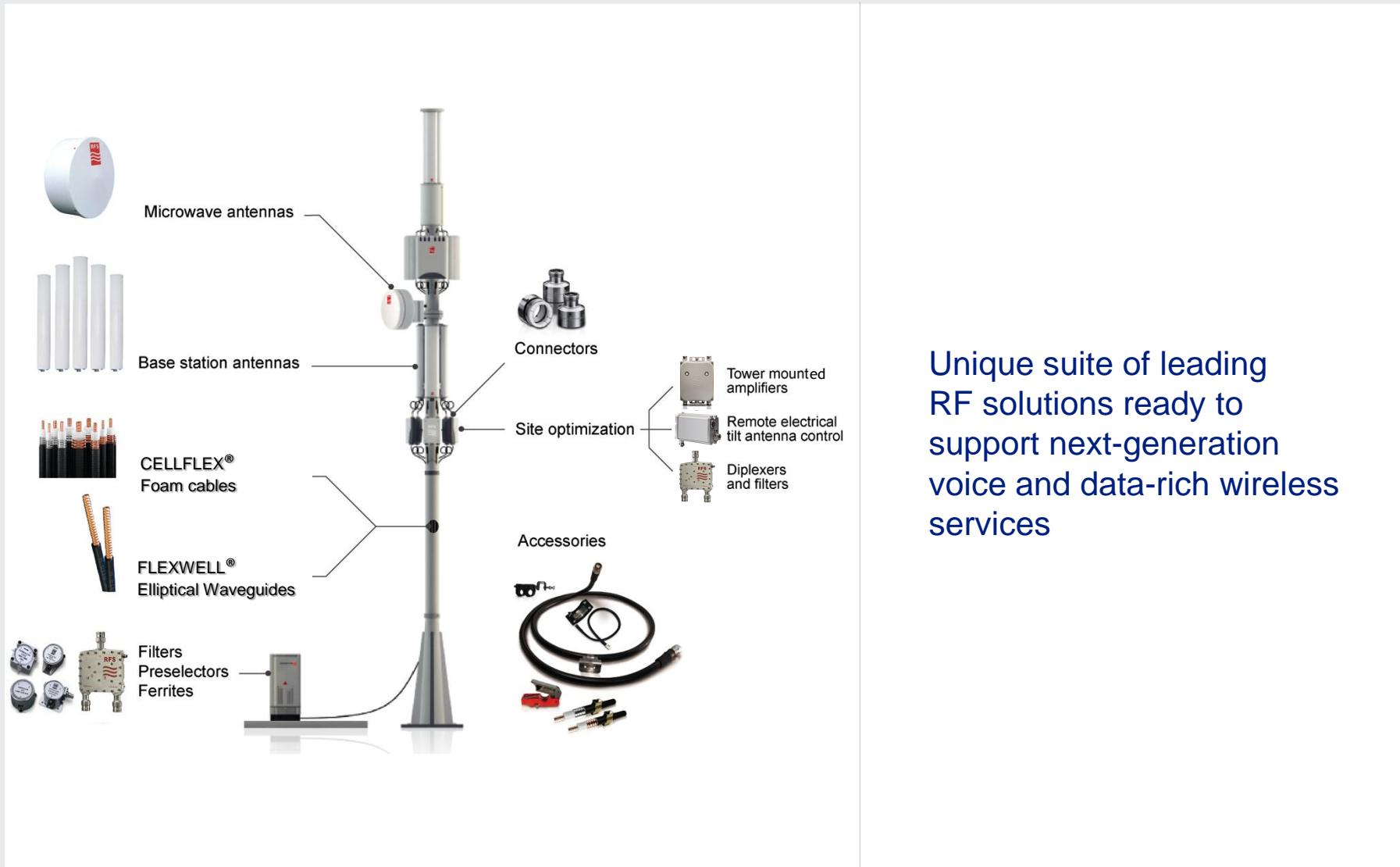
Indoor coverage



TV & Radio



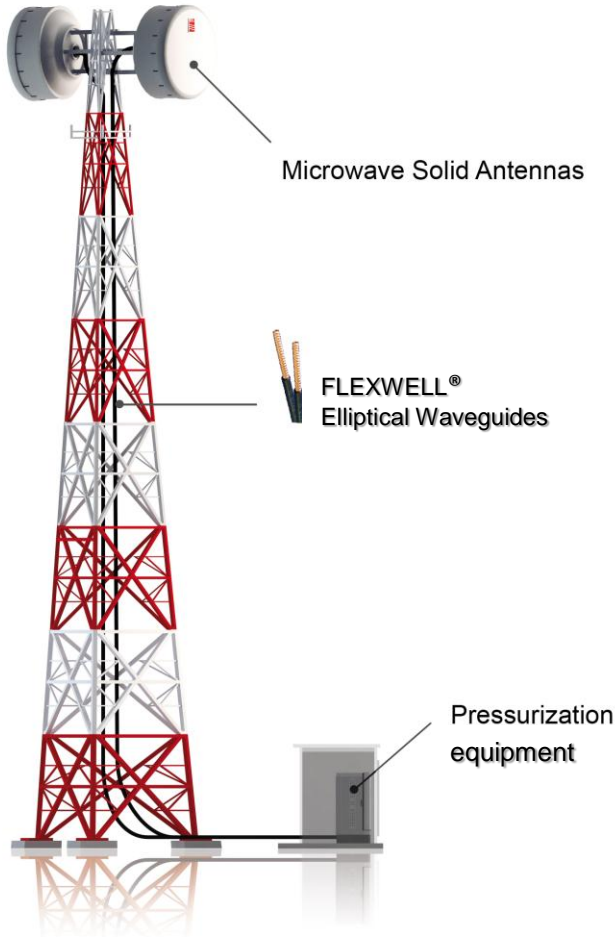
# Cellular Sites



Unique suite of leading RF solutions ready to support next-generation voice and data-rich wireless services



# Microwave Links



## Accessories



## Connectors



## Clamp



## Coupler



## Twist flex Cable



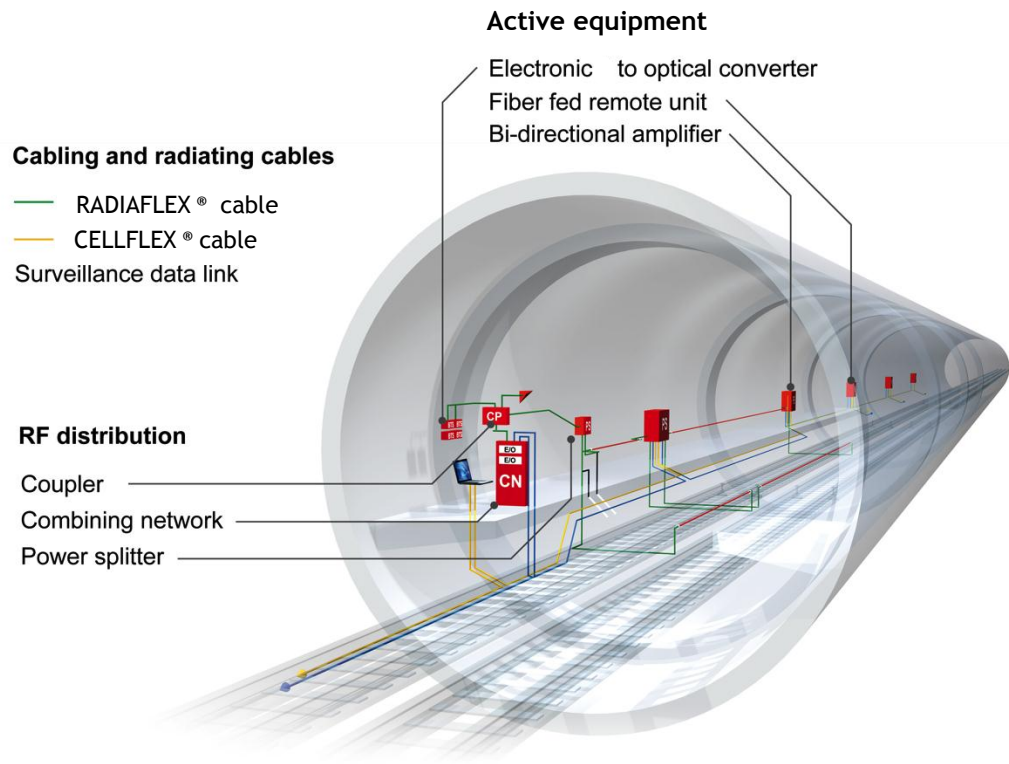
## OMT

Ultra-high performance,  
rugged antennas  
manufactured in every  
region of the globe  
for faster deployments





# Indoor Coverage

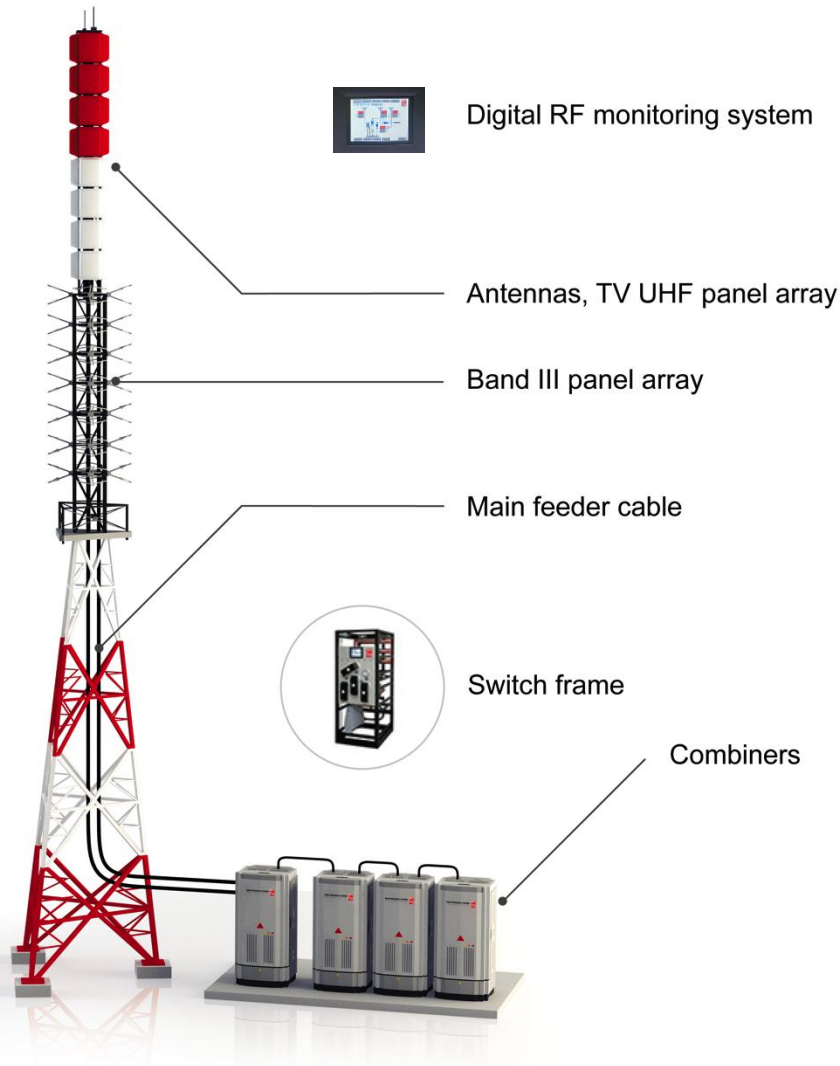


Best-in-class coverage systems for mission-critical and commercial radio services

Support for multi-carrier, multi-service applications in road and rail tunnels

Unique patented radiating cable for multi-technology applications

# Broadcast



Offering superior RF solutions for broadcasters worldwide, from analog radio and TV to DAB, mobile TV and digital TV switchover



# Major Production Facilities and Sales Offices



Meriden  
USA



Shanghai  
China



São Paulo  
Brazil



Melbourne  
Australia



Hannover  
Germany



Trignac  
France

## Technical support & sales offices in 20 countries

### North America

Meriden  
San Jose  
Wallingford

### Latin America

Buenos Aires  
Mexico City  
São Paulo  
Santiago

### Europe

Copenhagen  
Haddenham  
Hannover  
Madrid  
Moscow  
Paris (HQ)  
Trignac / Lannion  
Vimercate

### Middle East, India & Africa

Dubai  
Johannesburg  
Kolkata  
New Delhi  
Mumbai

### Asia & Pacific

Bangkok  
Beijing  
Guangzhou  
Hong Kong  
Melbourne  
Shanghai  
Singapore  
Taipei  
Tokyo

# Production Facilities by Product Line





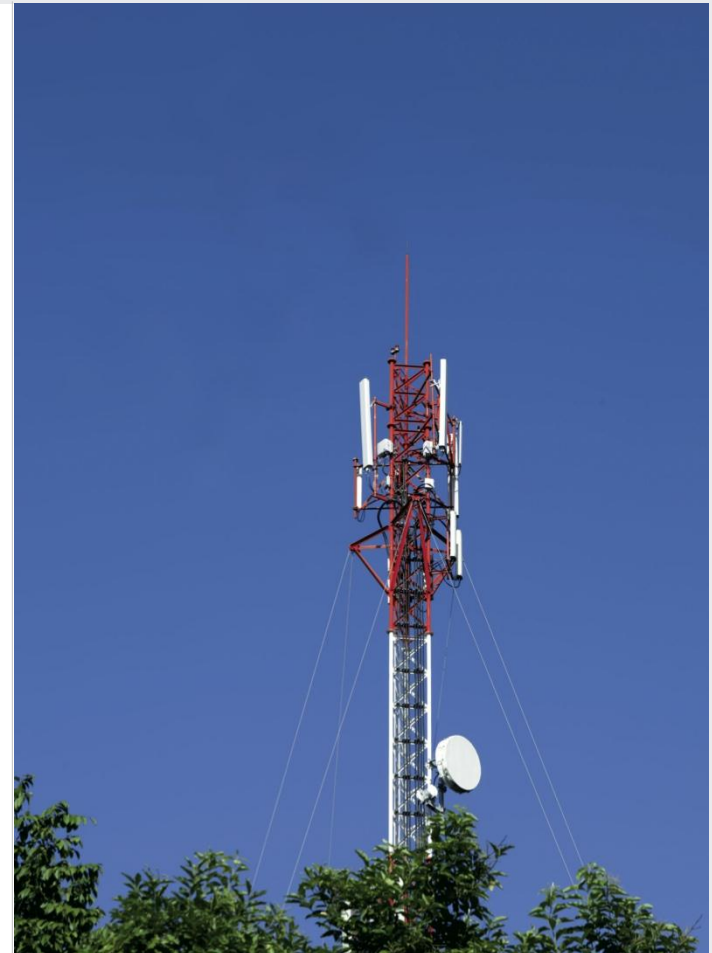
# General Missions

## General missions

- Leader in new technologies
- Innovative product concepts: WindMaster™, HYBRIFLEX™, RF X-TREME™
- Dedicated to lightweight designs
- End-to-end solutions covering the entire RF chain
- Global presence and manufacturing excellence
- Fast delivery time and superior service
- Environmental protection and energy efficiency



Radio Frequency Systems carries off coveted Emmy Award

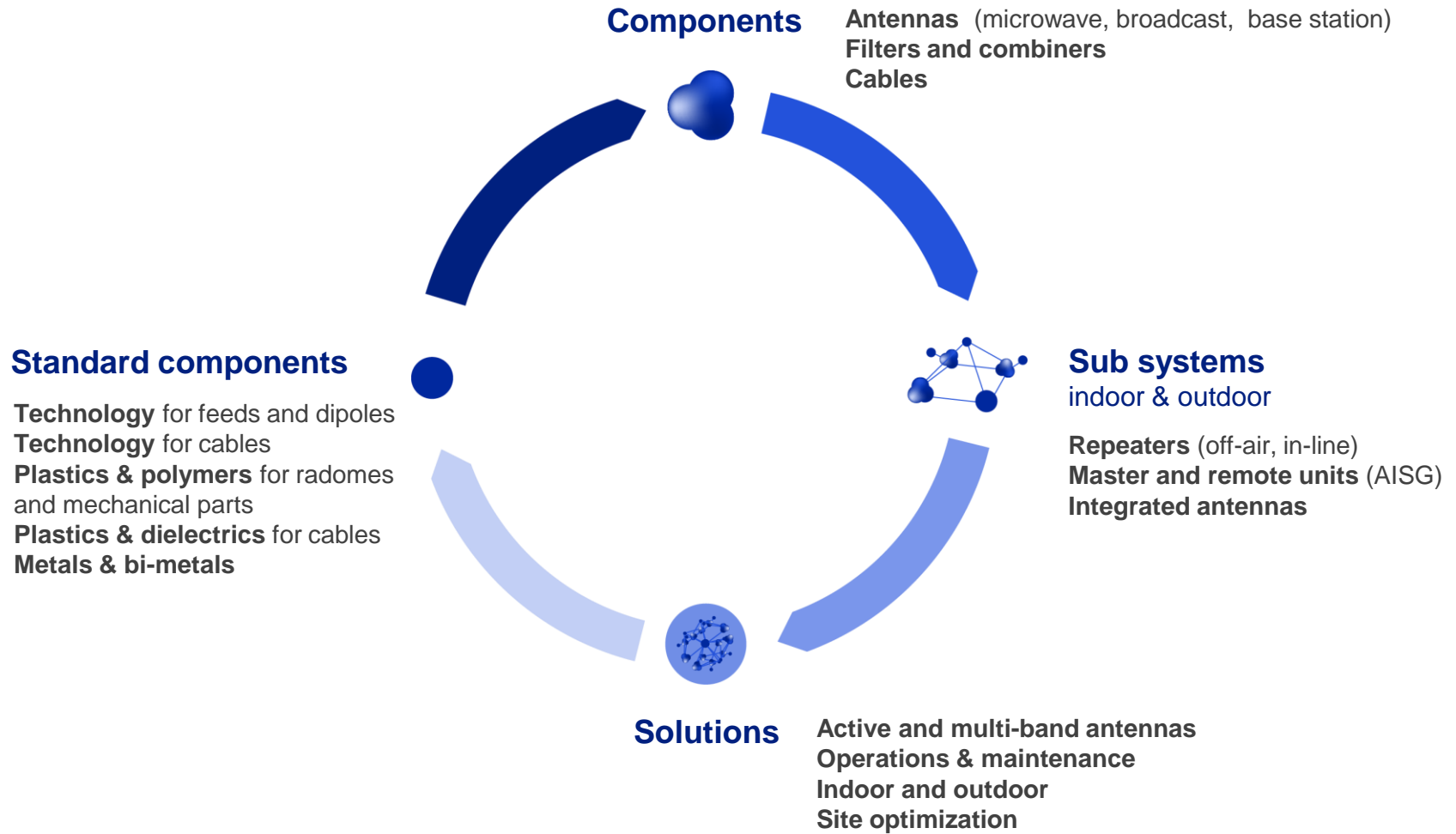


**Proven longevity thanks to premium performance and unrivaled quality.**





# RFS Technology Roadmap





# RFS Product Profile

## Base Station Antennas and Site Optimization



## Infrastructure Solutions for RRU Deployments



## Transmission Lines



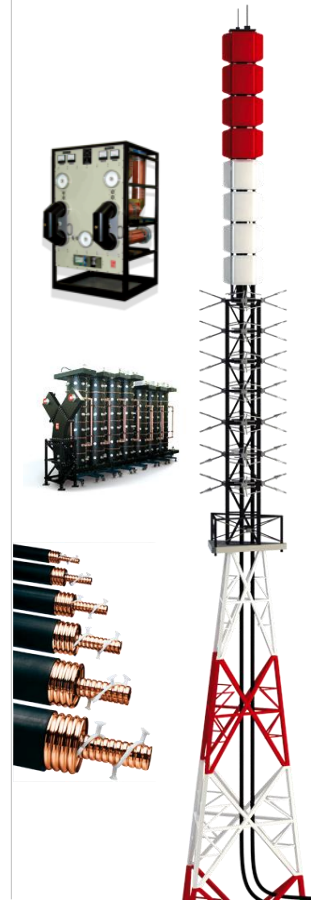
## Wireless Indoor Solutions



## Microwave Antennas



## Broadcast Systems



# Base Station Antennas

## Position today and Future Directions



RFS BSA portfolio covers frequencies up to 2.7 GHz, including LTE combinations

### ⊕ Position today

- Massive introduction of Digital Dividend II and TDD compatible antennas
- Wide suite of legacy and LTE antennas
- Integration of embedded RET
- WindMaster™: Multi-band antennas with industry's lowest tower loading, to be used where site upgrade is tough
- RF X-TREME™ Ultra Broad Band: Ideal choice for MIMO applications
- 2 highly efficient and flexible production sites

### ⊕ Future directions

- Advanced research on smart and multi beam antennas
- Continuous development in radiating technology and energy efficiency
- Increased coverage for multi-band antennas
- Improved coverage for global LTE antennas
- Reduced footprint in terms of size and tower loading
- Anticipation of new frequency bands (600 MHz for USA – 3.5 GHz worldwide)
- Improve the integration of the antenna system in its environment :
  - ✓ Visual aspect
  - ✓ Technical aspect



# Base Station Antennas

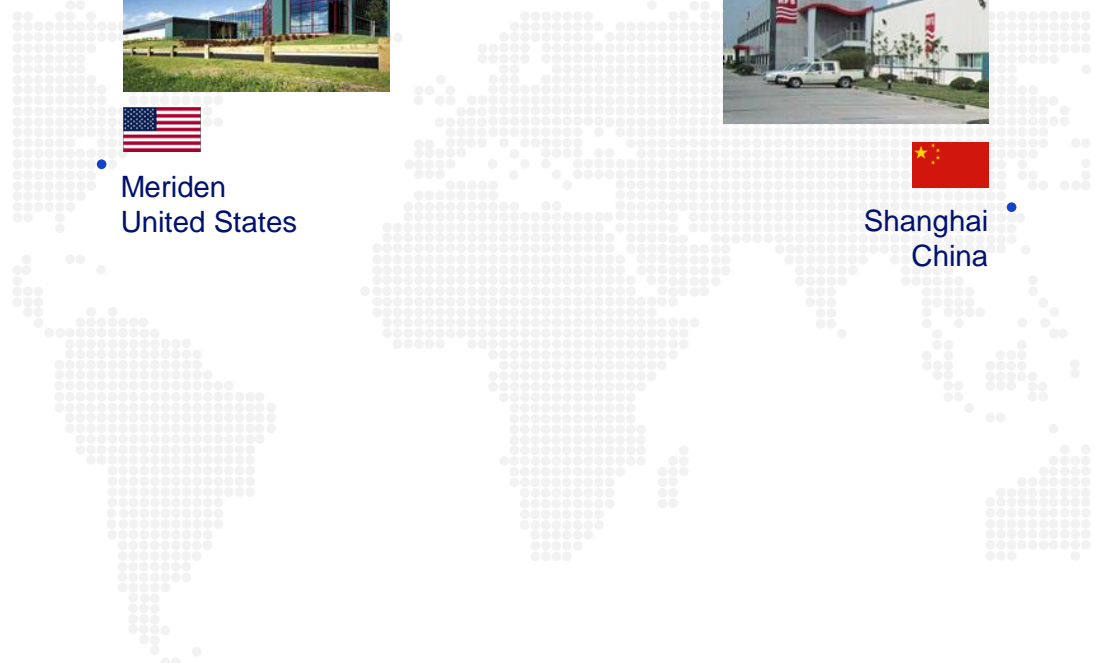
## Production Sites



Meriden  
United States



Shanghai  
China



# HYBRIFLEX™ to The Antenna

## Position today and Future Directions



RFS serves its customers with innovative infrastructure solutions that support the introduction of RRU technology in networks.

### ⊕ Position today

- Founded in 2010 to support customers in their technology migration to Remote Radio Units (RRUs) with best-in-the-market infrastructure solutions
- Under the brand HYBRIFLEX™, RFS offers a complete portfolio of hybrid cables to meet requirements from MNOs and all major RRU manufacturers
- HYBRIFLEX™ cables are engineered to make RRU deployments easier, faster and more reliable
- HYBRIFLEX™ cables are ready for LTE
- The product families DC-FIT™ and F/O-FIT™ allow easy and cost-effective swapping from a conventional BTS to a distributed BTS with RRU
- Improved installation due to space-efficient designs

### ⊕ Future directions

- Continuous extension of HYBRIFLEX™ cable family to meet customer needs in a single RAN application with multiple services and RRUs per sector
- Customized infrastructure solutions for large RRU rollouts
- Innovative logistics concepts to enable fast, on-demand delivery to RRU deployment projects

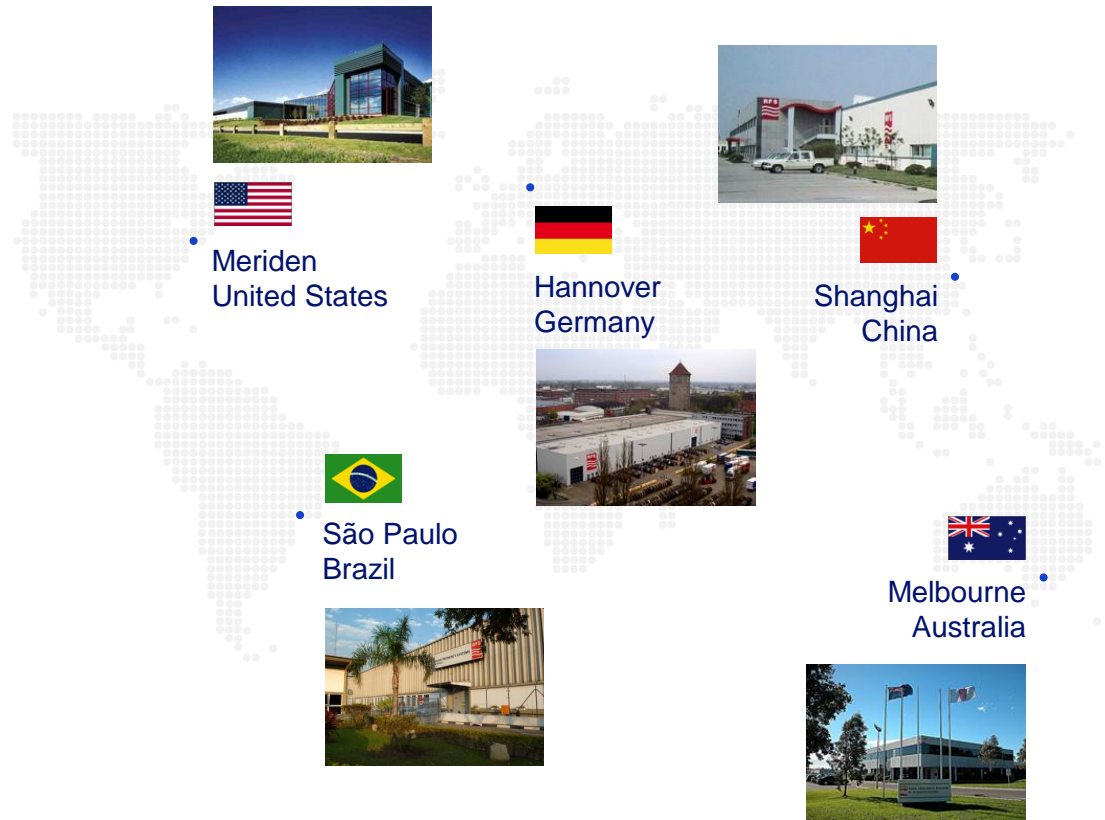




# HYBRIFLEX™ to The Antenna

## Production Sites

Aluminium OC  
PE external jacket  
Power cable (pair) with an internal jacket (PE)  
Optical cable (pair) with an internal jacket (PE)

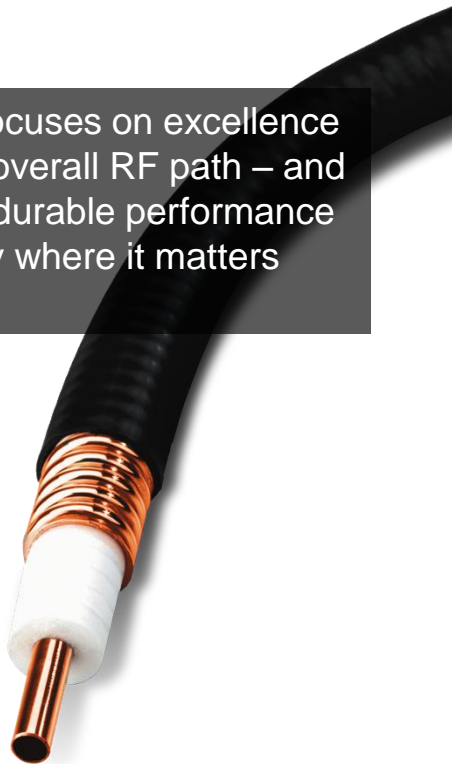




# Transmission Lines

## Position today and Future Directions

RFS focuses on excellence in the overall RF path – and offers durable performance exactly where it matters most!



### ⊕ Position today

- Technology leader and inventor with many product first, including the corrugated coaxial cable
- Most complete corrugated copper and aluminum cable portfolio — CELLFLEX®
- 100% common accessories for CELLFLEX® copper and CELLFLEX® Lite aluminum cables
- Two tailored accessory families satisfying all application needs:
  - ✓ OMNI FIT™ premium for PIM-critical applications
  - ✓ OMNI FIT™ standard for typical requirements and optimized rollout costs
- LTE-ready product portfolio
- Full recyclability for CELLFLEX® copper and aluminum cables
- Reduced TCO due to PIM-aware connector and jumper technology
- Improved installation due to space-efficient designs

### ⊕ Future directions





- Continuous extension of HYBRIFLEX™ cable family to meet customer needs in a single RAN application with multiple services and RRUs per sector
- Customized infrastructure solutions for large RRU rollouts
- Innovative logistics concepts to enable fast, on-demand delivery to RRU deployment projects



# Transmission Lines

## Production Sites



-   
Meriden  
United States
-   
Hannover  
Germany
-   
Shanghai  
China
-   
São Paulo  
Brazil

# Radio Link Networks

## Position today and Future Directions



The most complete microwave antenna portfolio, manufactured in all regions to support rapid deployments and help operators meet ever-increasing traffic requirements

### ➤ Position today

- RFS is a premium supplier of microwave antennas for OEMs
- All common frequency bands and sizes are available
- No compromises on performance with the most stringent qualification procedures including wind-tunnel tests
- Low-profile design CompactLine® EASY antennas to reduce transportation costs, wind load and antenna weight
- The best 3 ft/1 m antenna on the market: SC3
- Manufacturing in all regions for shorter lead times and better service

### ➤ Future directions

- A unique 2-port OMT upgradable to 4 ports (pay-as-you-grow plan)
- E-Band antennas for ultra-high capacity links
- Small form antennas for low visual impact and evolution to small cells and HetNets



# Radio Link Networks

## Production Sites



Meriden  
United States



Trignac  
France



Shanghai  
China



São Paulo  
Brazil







# Wireless Indoor Solutions

## Position today and Future Directions

We optimize and expand our comprehensive set of solutions to support the widest range of indoor coverage projects, from purely passive designs to intelligent active and turnkey networks

### ⊕ Position today

- Comprehensive in-building and in-tunnel solutions suite
- An expert blend of active and passive ClearFill® solutions to suit any building size or tunnel length
- Provide coverage for commercial & mission-critical services for 2G, 3G, 4G/LTE, DAB, DVB, GSM-Rail & TETRA
- Support single and multiple operators, single and multiple wireless services
- End-to-end indoor solutions offer including consultancy and product-attached services such as solution design and on-site acceptance for lowest-cost solutions
- Broadest RF bandwidth (380 MHz to 3.5+ GHz) passive indoor DAS
- CELLFLEX® and CELLFLEX® Lite lowest-loss feeder cables
- RADIAFLEX® best-in-class radiating cables up to 6 GHz

### ⊕ Future directions

- Strengthen global leadership in radiating cable technology through continuous portfolio evolution and introduction of innovative, future proof (full frequency spectrum) products aligned with changing market needs
- Distributed antenna concepts for 6 GHz — for example, radiating waveguides enabling real-time signaling and track-to-train applications with the highest data throughput demands

# Wireless Indoor Solutions

## Production Sites



Meriden  
United States



Hannover  
Germany



Shanghai  
China




São Paulo  
Brazil



# Broadcast Systems

## Position today and Future Directions



Every RFS radio and TV solution is fully custom designed and optimized to meet the most stringent requirements

### ➤ Position today

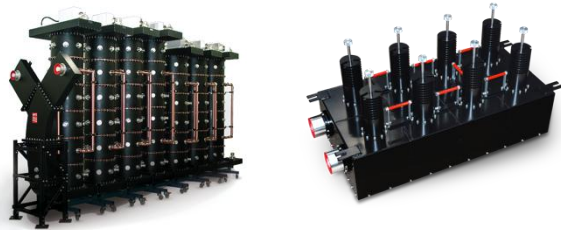
- Suite of antennas, combiners, filters, transmission lines, and switch frames
- From analog radio & TV to DAB, mobile TV and DTV
- Unrivalled digital switchover (DSO) project expertise
- FM, UHF/VHF panel array and slot antennas
- HELIFLEX® air-dielectric transmission lines from 3/8" to 9"
- Numerous broadband HF antenna designs

### ➤ Future directions

- New post-DSO broadcast applications
- Best-in-class digital mask filters
- Variable polarization antenna technology
- Low-wind load panel array solutions

# Broadcast Systems

## Production Sites and Global Support for Broadcast



RFS's adjacent channel combiners' win an Emmy Award for TV broadcasting



The World Technology Competence Centre for Broadcast is located in [Melbourne, Australia](#)



# RF Site Optimization Products

## Position today and Future Directions

RFS is committed to being the leading supplier of high performance site optimization equipment across all standards and frequencies



### ➤ Position today

- Broad portfolio of products for LTE network upgrades and overlays around the world
- Product suite includes cross-band and in-band combiners, co-location filters, diplexers, duplexers and tower mounted amplifiers
- Solutions for all telecommunication technologies – LTE700 through LTE2600 and everything in between
- Highly efficient and flexible production of RF assemblies
- Rapid development of co-location filter and combiner solutions
- ShareLite™ leading-edge diplexers and triplexers ideal for fast and cost-effective LTE overlays
- UltraAmp™ lightweight tower mounted amplifiers optimize site coverage and throughput

### ➤ Future directions

- New solutions for TDD and FDD LTE Bands from 600MHz to 3.5GHz
- Unique filtering solutions for smaller size and high performance
- New advanced material options for lighter weight products with lower insertion loss
- Tailored filtering solutions for special applications

# RF Site Optimization Products

## Production Sites



Meriden  
United States





# Ferrocom

## Position today and Future Directions

RFS Ferrocom excels at customizing high-quality ferrite devices to precise customer specifications – including unique electrical requirements or enhanced performance specifications



### ➤ Position today

- Ferrite isolators and circulators from 80 MHz to 40 GHz
- SMT, Drop-in, Coaxial and Waveguide isolators
- 4-port coaxial isolators and circulators for public safety applications
- Excellent electrical performance and quality
- Ferrites for :
  - ✓ Microwave radio and Microwave sub-systems
  - ✓ Sat-Com applications
  - ✓ Mobile cellular telecommunications (GSM, W-CDMA, LTE, Small cells, Broadband wireless)
  - ✓ Public safety

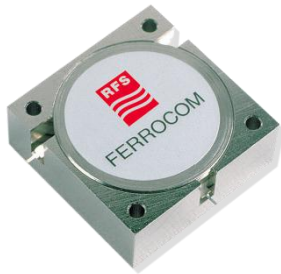
### ➤ Future directions

- Product development for LTE and Small cells base stations and broadband wireless applications
- Low-IMD and high power devices for wireless data applications
- Leveraging technical leadership in ferrites to capture more of the high-volume OEM market



# Ferrocom

## Production Sites



Shanghai  
China



San José  
United States





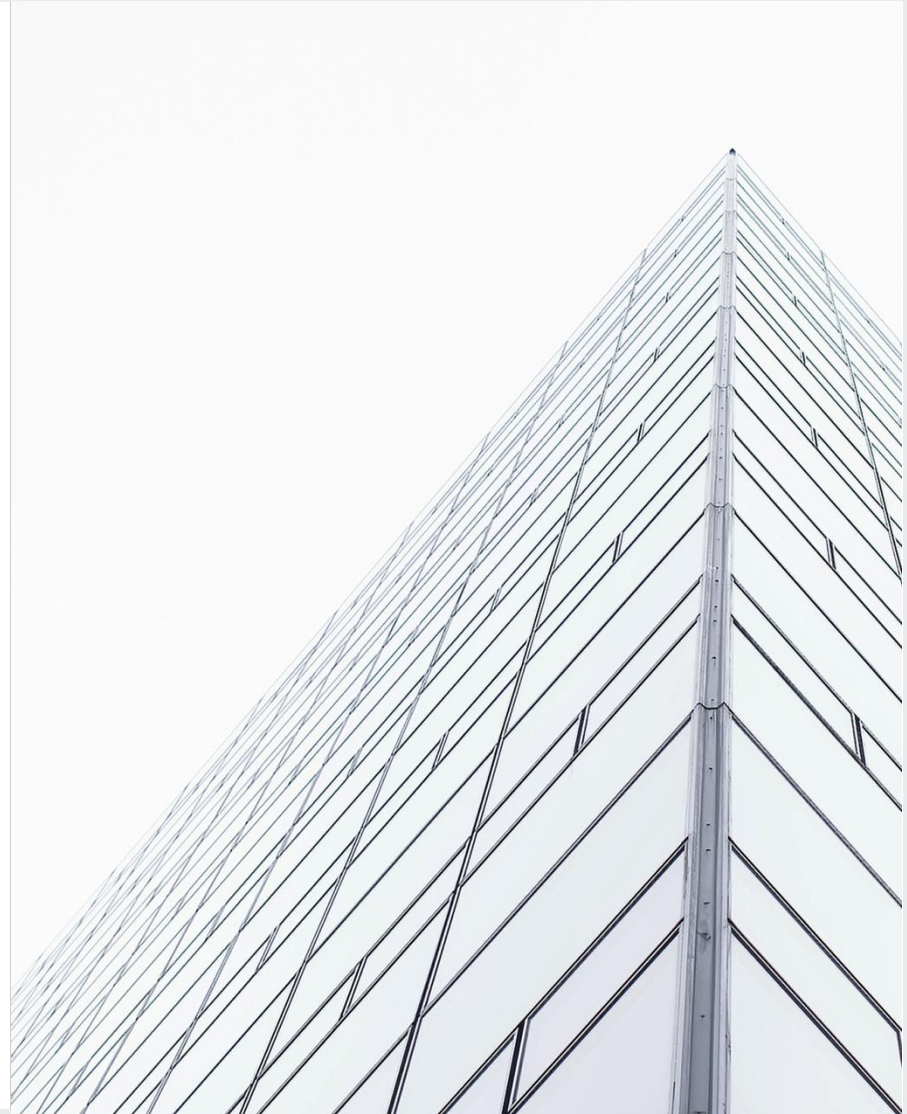
# RFS: The Clear Choice®

We work closely with our customers, anticipating their evolving technology needs and offering powerful and cost-efficient products and solutions.

We provide dedicated customer service, expert technical advice and support, and a total product package.

We offer advanced engineering capabilities, superior field support, and dedicated technical assistance and training.

⊕ **These value-added services, plus the convenience of a single source, make RFS the clear choice... time after time.**





# Follow us !





[www.rfsworld.com](http://www.rfsworld.com)