Power Allocation in Vehicular Networks with Lossy Intra-Links

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Lossless-link paradigm

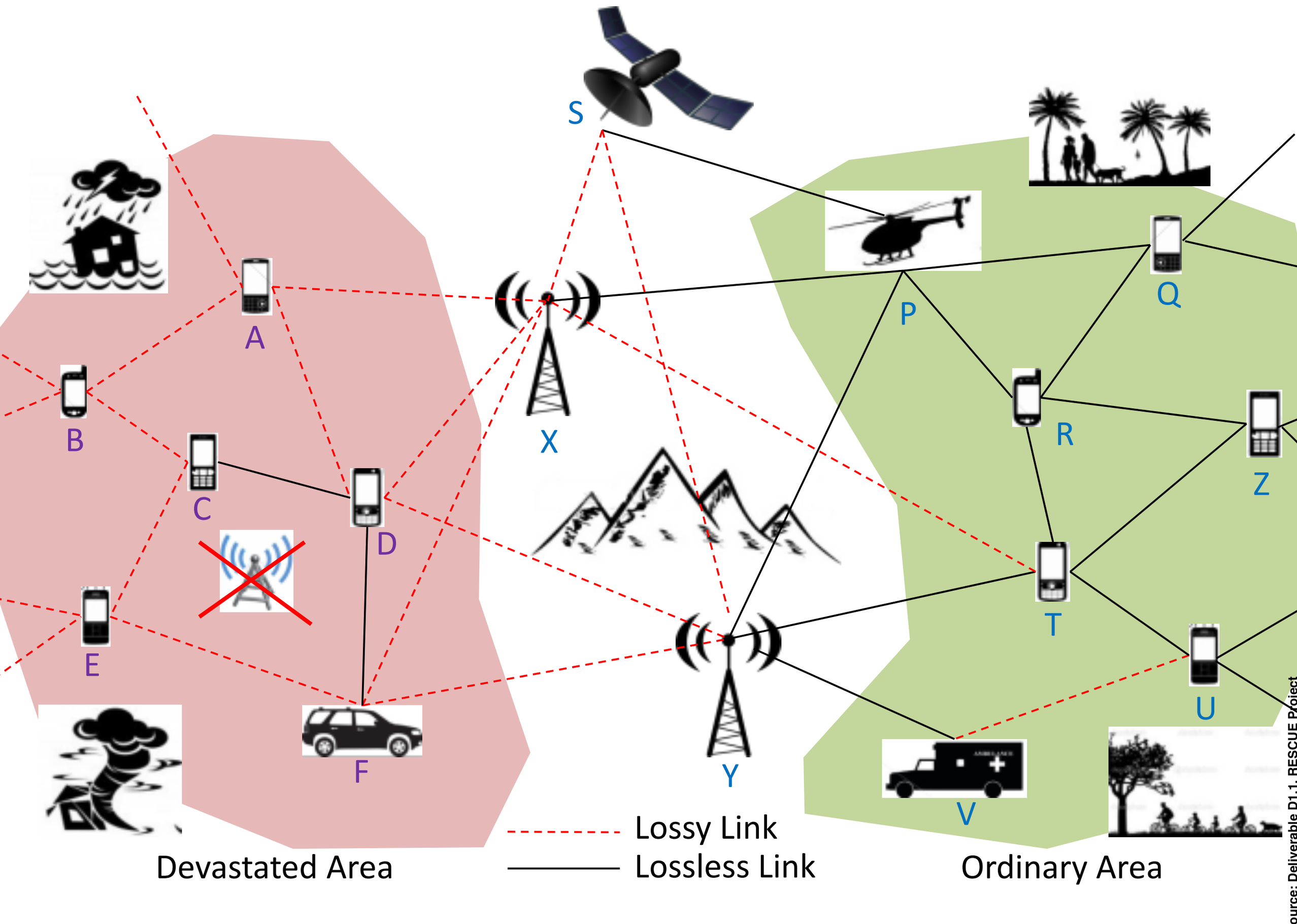
Strong error-correction coding

Accurate channel estimation and synchronization

Signaling and retransmission protocols

High power consumption, large delay, and reduced spectral efficiency

Traditional communication approaches prove inefficient in unpredictable and harsh environments.


S
A
B
C
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Z
Lossy Link
Lossless Link
Devastated Area
Ordinary Area
Source: Deliverable D1.1, RESCUE Project

Road Side Equipment (RSE)

Infrastructure to Vehicle coverage

Vehicle-to-Vehicle (V2V) Links

Multi-hopped multi-route data exchange among vehicles for emergency communications

Vehicle mountable device with unix based operating system with networking capabilities for emergency V2V communications

Source: Deliverable D1.1, RESCUE Project

The RESCUE paradigm

Links-on-the-fly Technology for **R**obust, **E**fficient and **S**mart **C**ommunication in **U**npredictable **E**nvironments

Multi-route, multi-hop information transfer based on potentially lossy links

Intra-link errors are forwarded to destination

Correlation among multiple copies is exploited to recover the message via joint decoding

Theoretical background

Cooperative relaying…

… allowing for intra-link errors

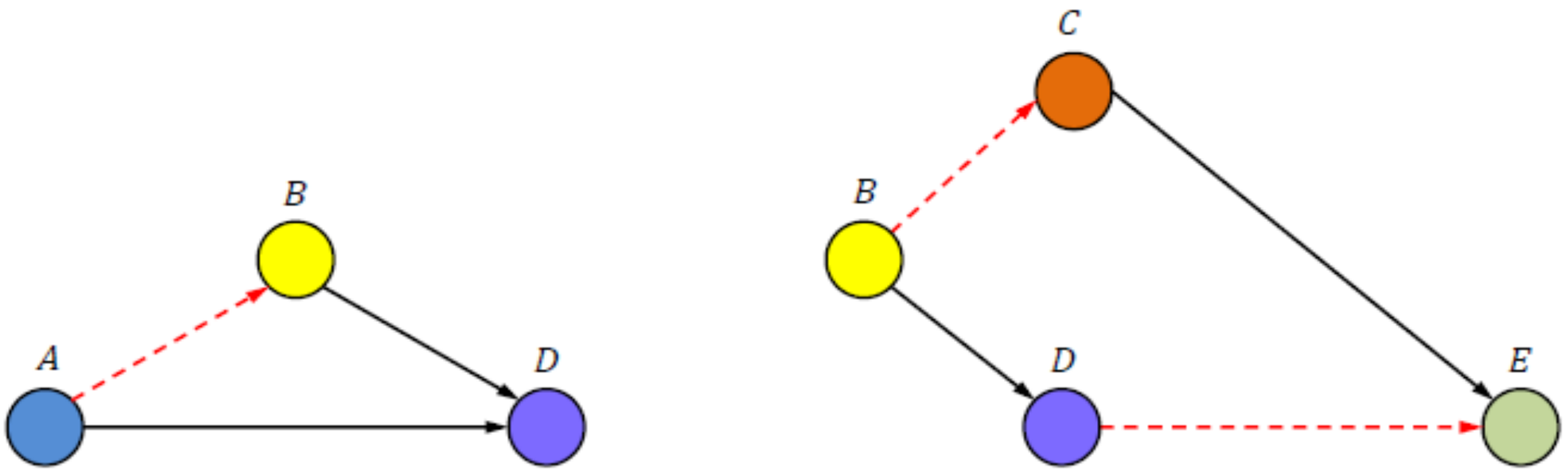
Multi-route diversity gain

Reduced outage probability

Higher spectral efficiency

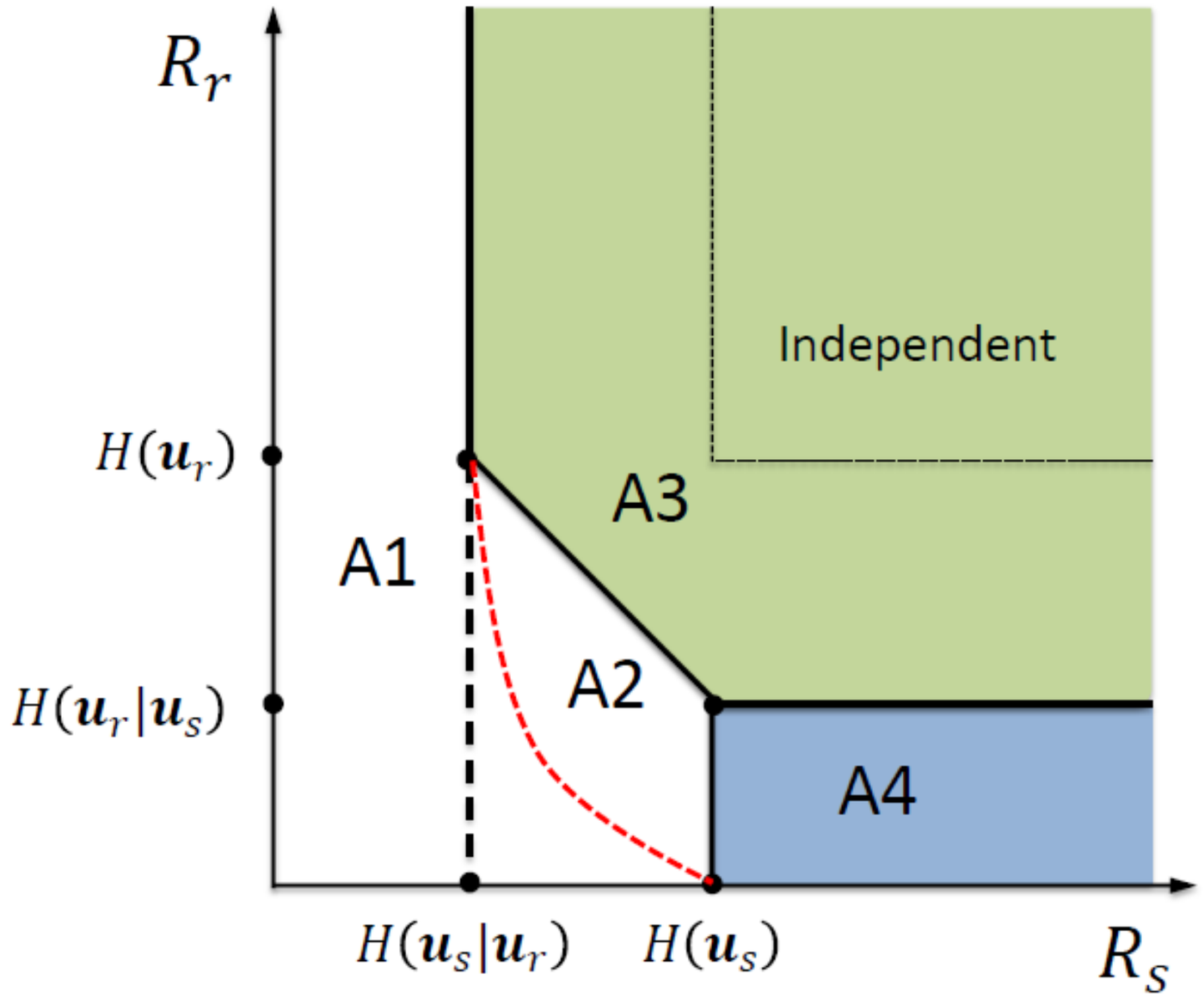
More flexible allocation of transmit power

Lossless/lossy networks



Source: Deliverable D1.1, RESCUE Project

Slepian-Wolf rate region



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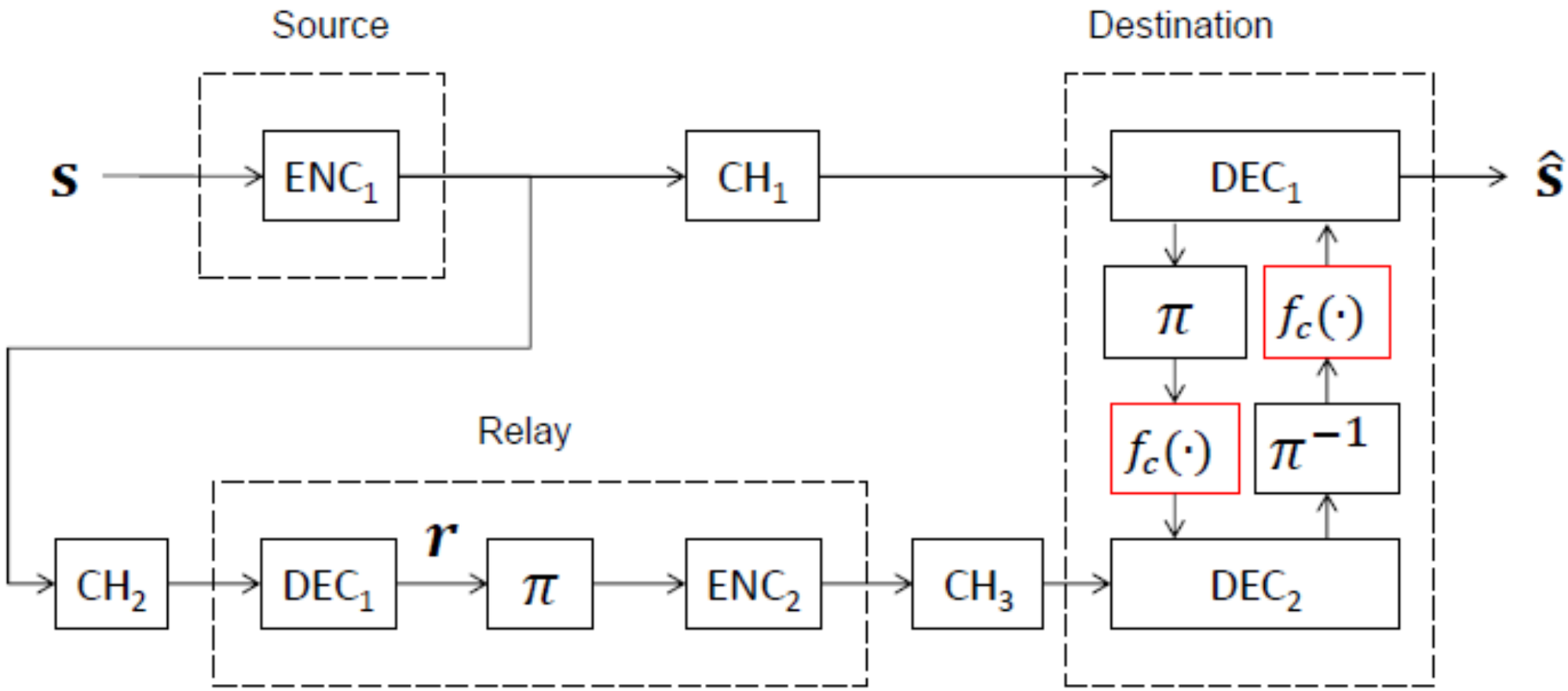
Distributed Turbo code



Source: Deliverable D1.1, RESCUE Project

Our contributions

Past

Multi-route CEO problem, Rayleigh fading

Modified Slepian-Wolf rate region

Powerful design tool based on asymptotic analysis

Efficient power allocation design

Validation into practical coding schemes

Present

Extension to Nakagami fading

Design proves tricky when
routes are unequally distributed

Validation into practical coding schemes

Future

Extension to more realistic propagation scenarios

Vehicular networks deserve special attention
due to more severe channel conditions

Thank you.

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