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Communications Dependability Evolution

Between Convergence and Competition

Michele Morganti

Siemens Mobile Communications - Italy

WCC 04 / TOP 3

Fault Tolerance for Trustworthy and Dependable Information Infrastructures

Toulouse – August 23-24 2004

PSTN

… “The Network in the Cloud”

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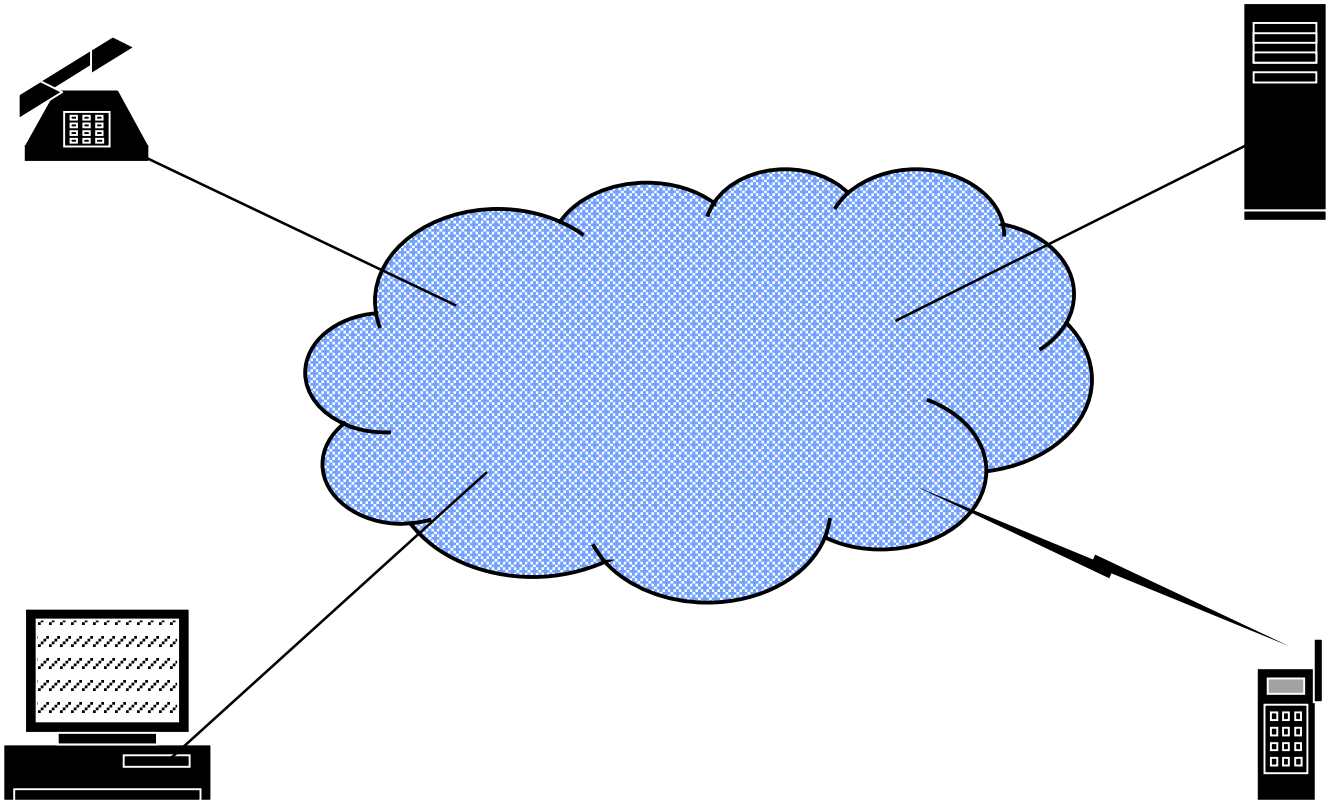

PSTN

Key characteristics

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- Huge *(10^6 Nodes, 10^9 Terminations, worldwide coverage)*
- Relatively simple *(few basic services, well structured, hierarchical, dumb terminals)*
- Very dependable *(highly redundant, short repair times, .99… availability requirements for every element)*
- Fully (self) standardized *(QoS, architecture, protocols, …, mechanics and cables)*
- Everywhere a monopoly …

Value for Money

Demand and Offer

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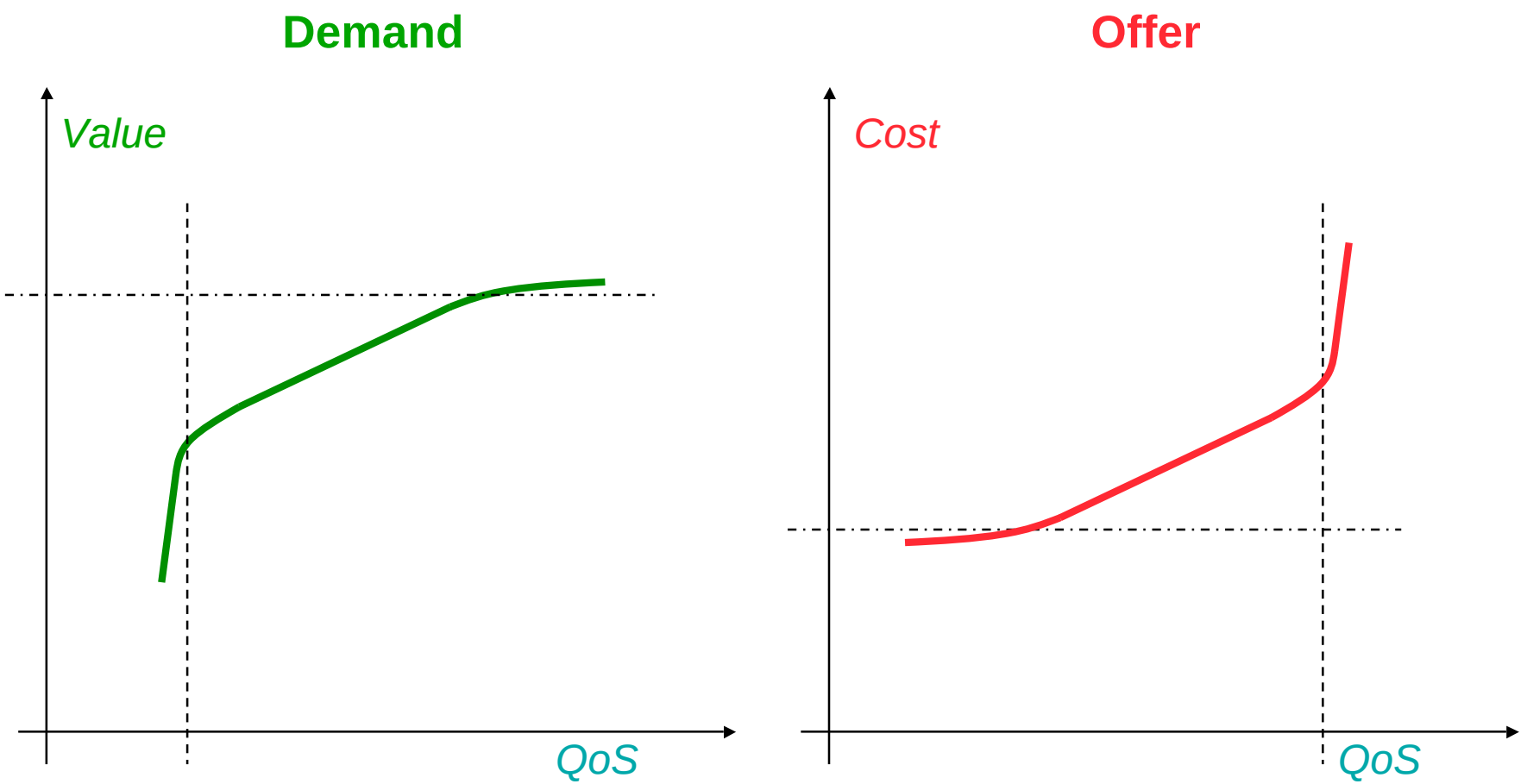

Value for Money

Demand vs. Offer

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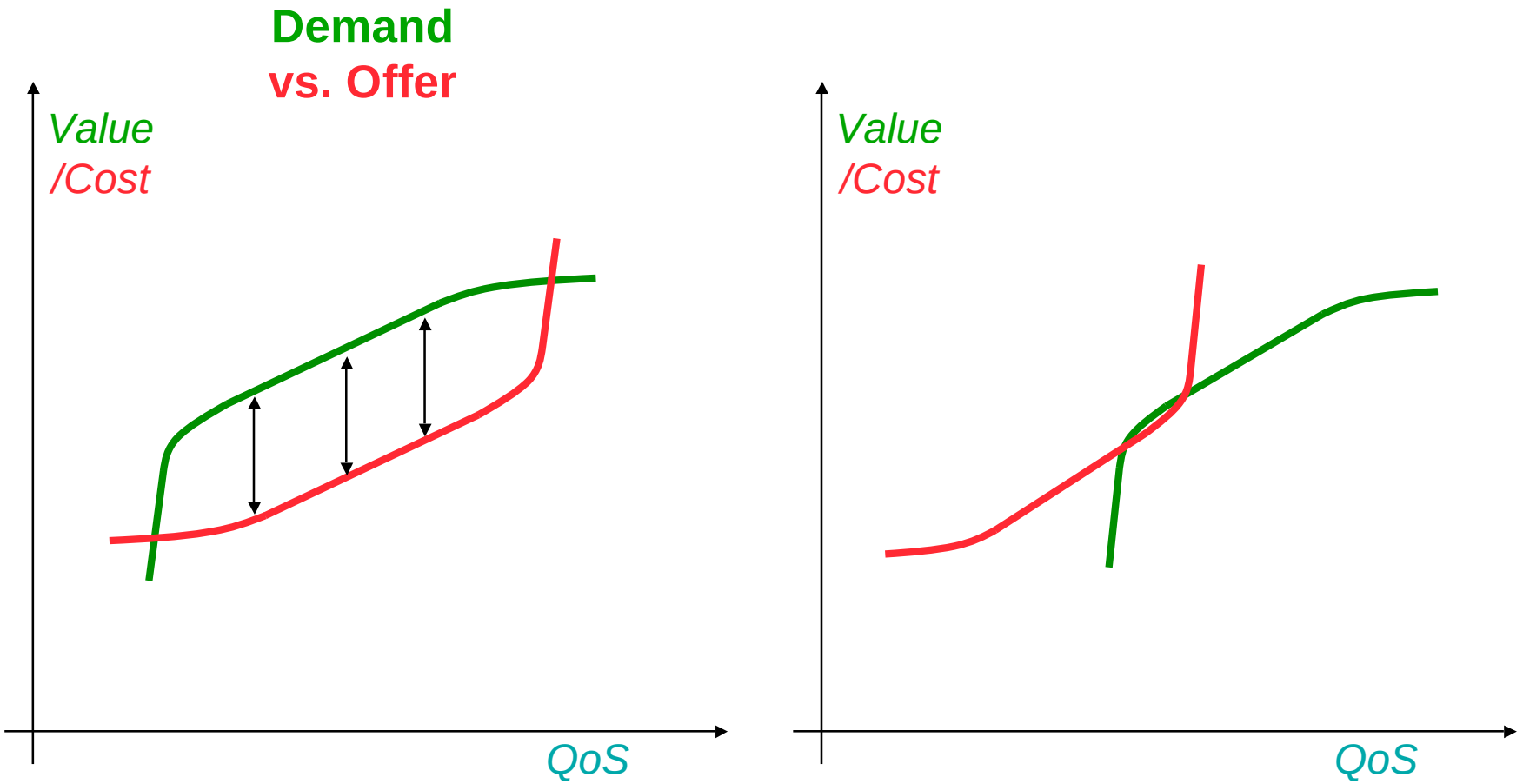

Value for Money

The distortions of Monopoly

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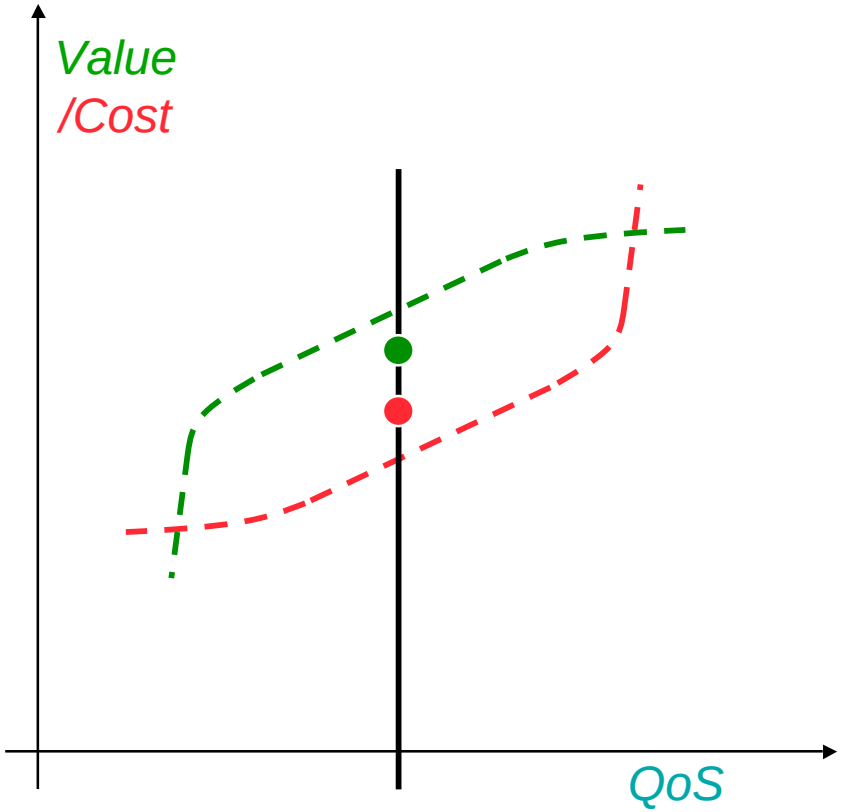
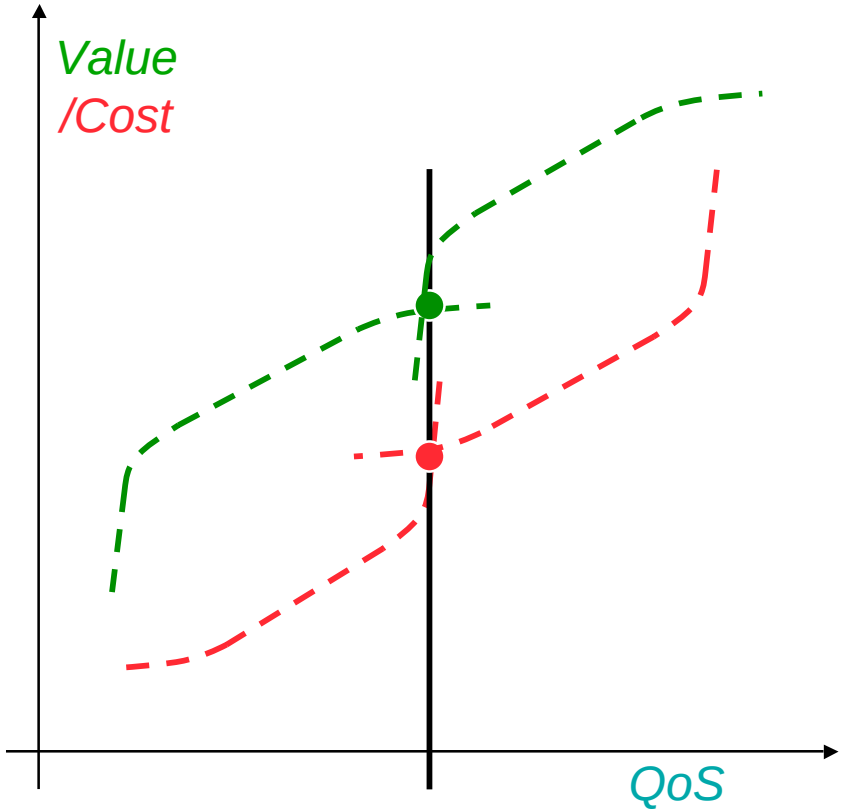
Demand vs. Offer
vs. Monopoly Standards





Liberalization and Competition

… beyond tariffs reduction

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- Direct market confrontation *(response, segmentation, CRM and ARPU)*
- Fierce competition *(shorter term orientation, cost reduction, opportunistic behavior)*
- Many newcomers *(no traditions, no experience, no legacies)*
- Extensive de-/re-regulation *(less and lesser requirements, mainly limited to interoperability)*
- New, higher value added, services *(BB, content rich, customized, push)*
- Need to reconsider all assumptions and to reassess all solutions…

Liberalization and Competition

… an architectural Renaissance

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The Internet Lessons

… a paradigm revolution

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- Packets are definitely more general purpose and sometimes *(but not always)* better than circuits
- *De facto* standardization is definitely faster and sometimes *(but not always)* better than *de iure*
- Effective Governance does not imply centralization and direct ruling
- Dependability is not limited to availability and billing accuracy
- Content and applications can be more valuable than communications
- There's no lower limit to QoS *(if the price is right)* and there is always value in diversity

Access Technology Trends

Copper vs. Fiber vs. Air

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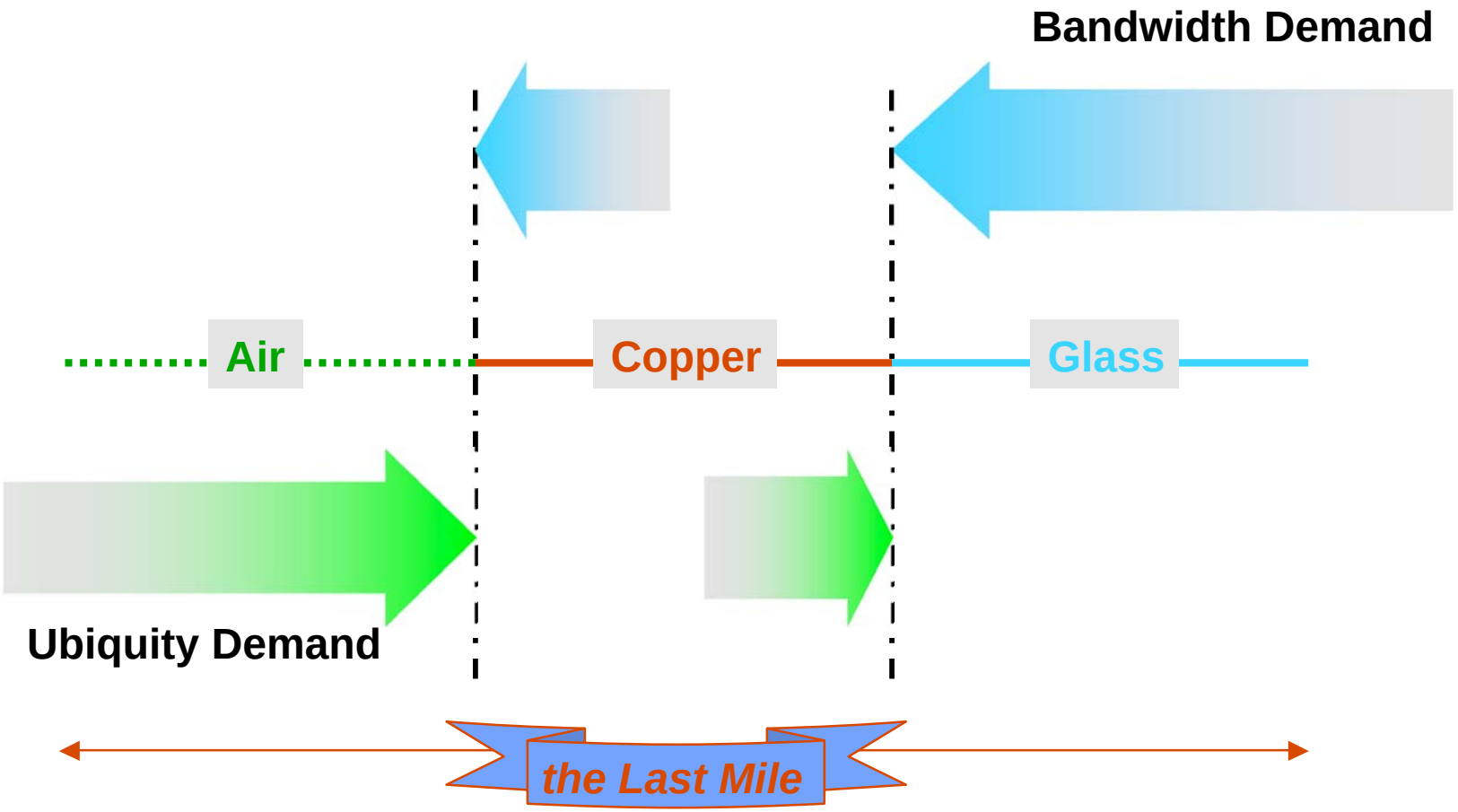

The Mobile Lessons

… towards wireless ubiquity

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- Ubiquity and mobility support are to most customers even more valuable than service quality and availability
- Wireless access can provide them both but can also expose users and operators to severe security threats
- Detailed customer profiling and localization have high value added potential but pose serious privacy concerns
- Competition implies direct offering confrontation but implicitly reduces obligations
- Equipment redundancy can be compensated by redundant coverage *(but not the opposite)*
- Terminal sophistication can reduce network costs and complexity but also operator power and control

Wireless Access

Networks vs. Terminals

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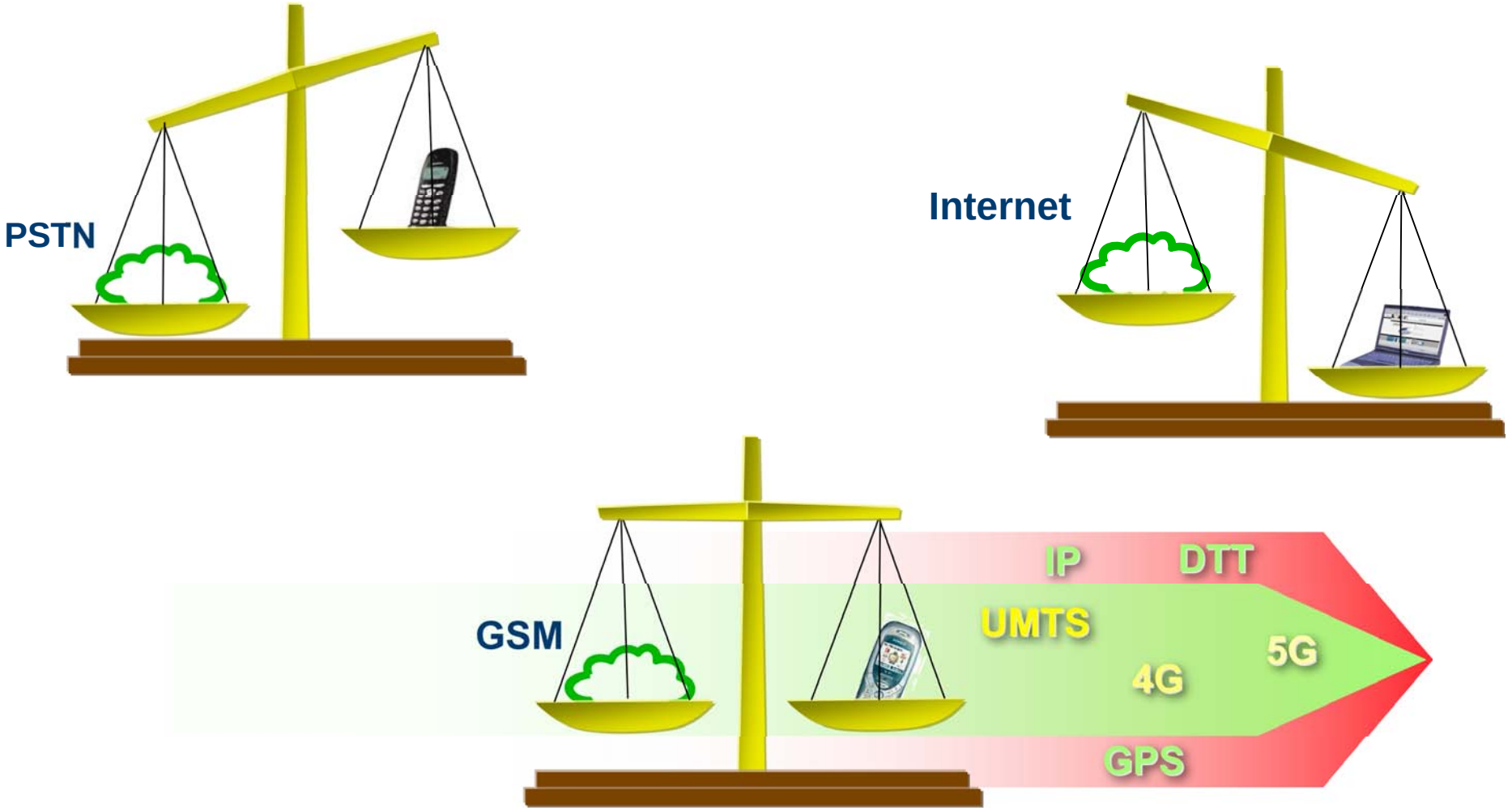

Wireless Access Technologies

… one too many ?

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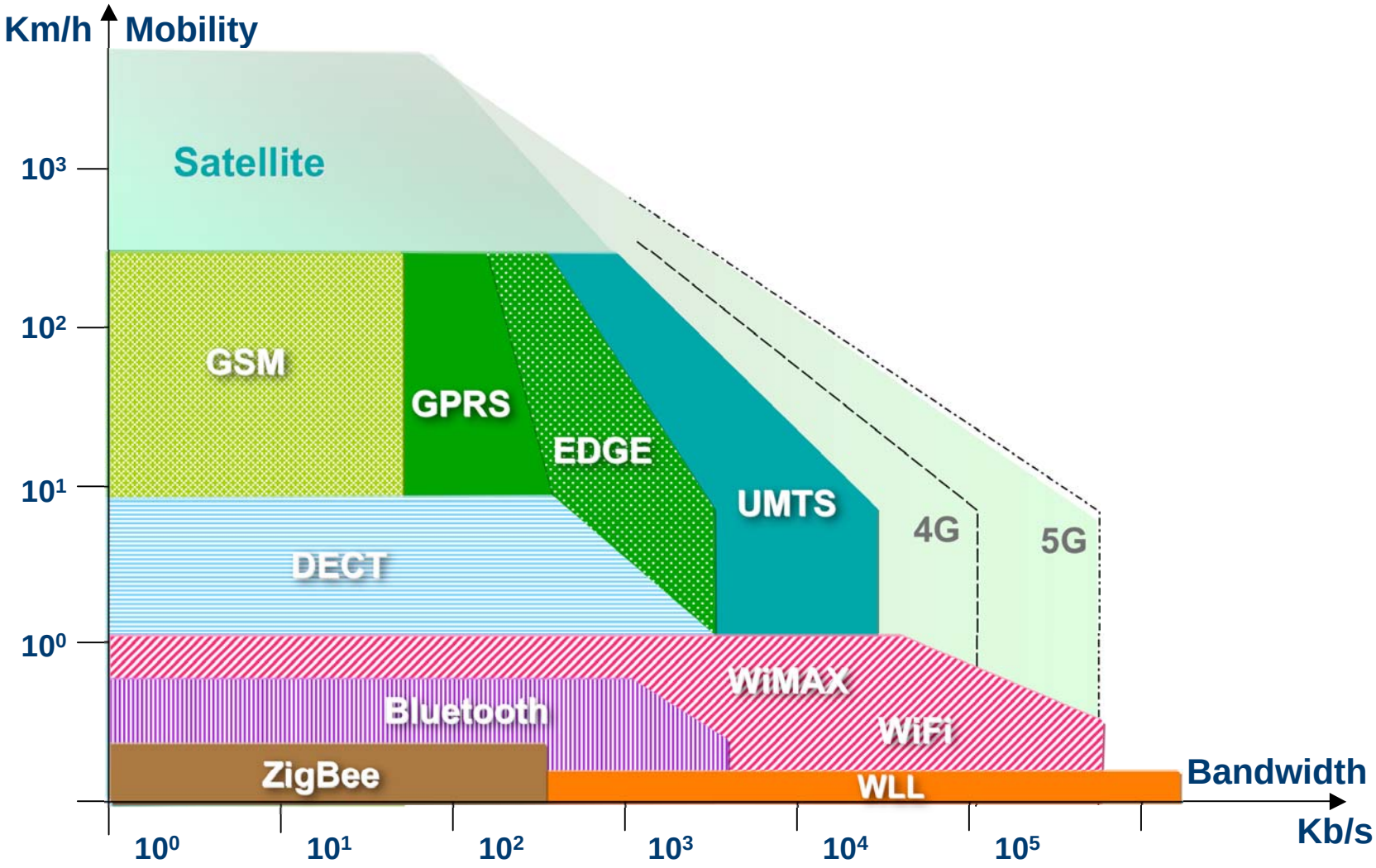

Wireless Access Technologies

… one too many choices ?

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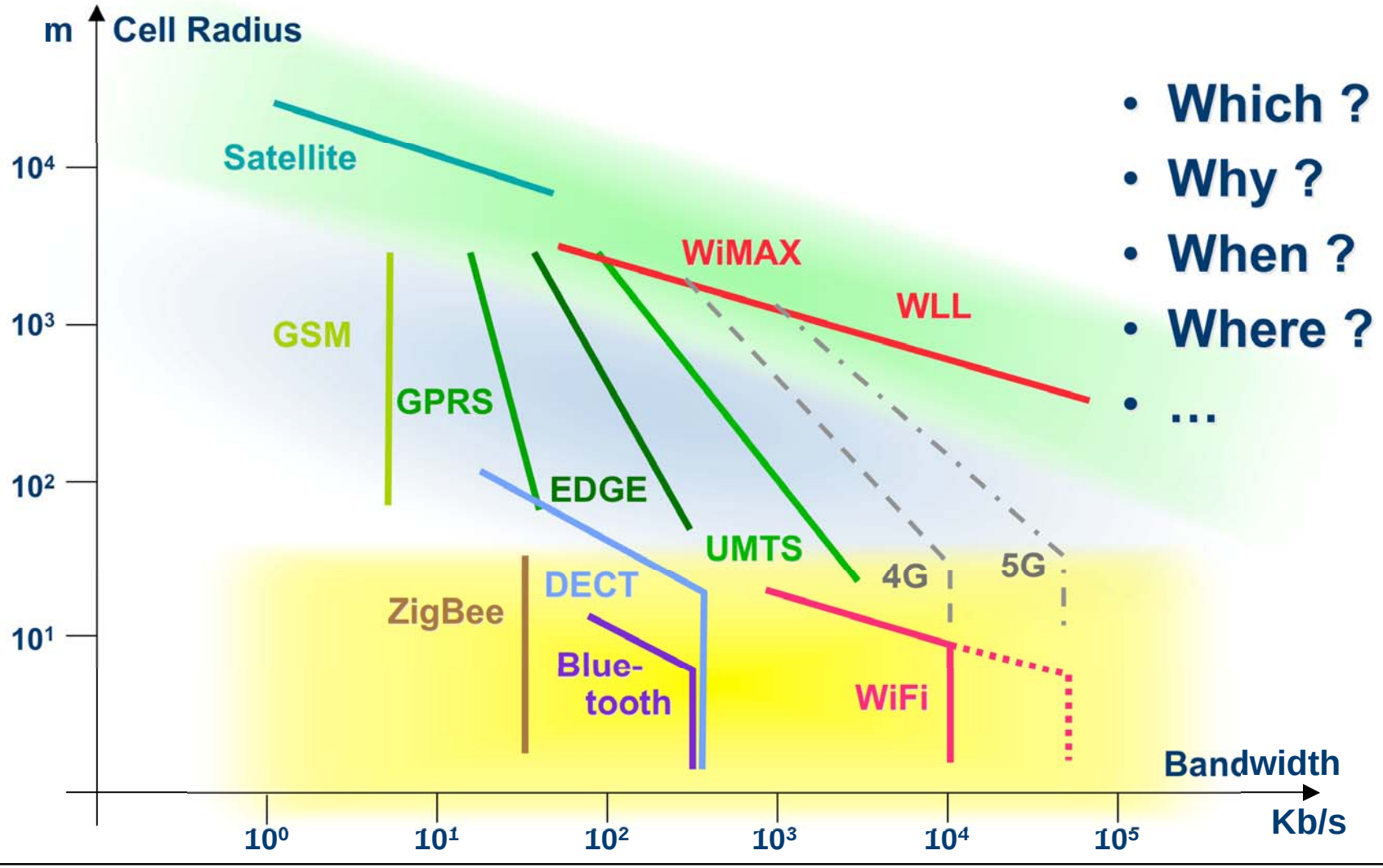

WiMAX and WiFi

… towards Broadband Wireless Ubiquity

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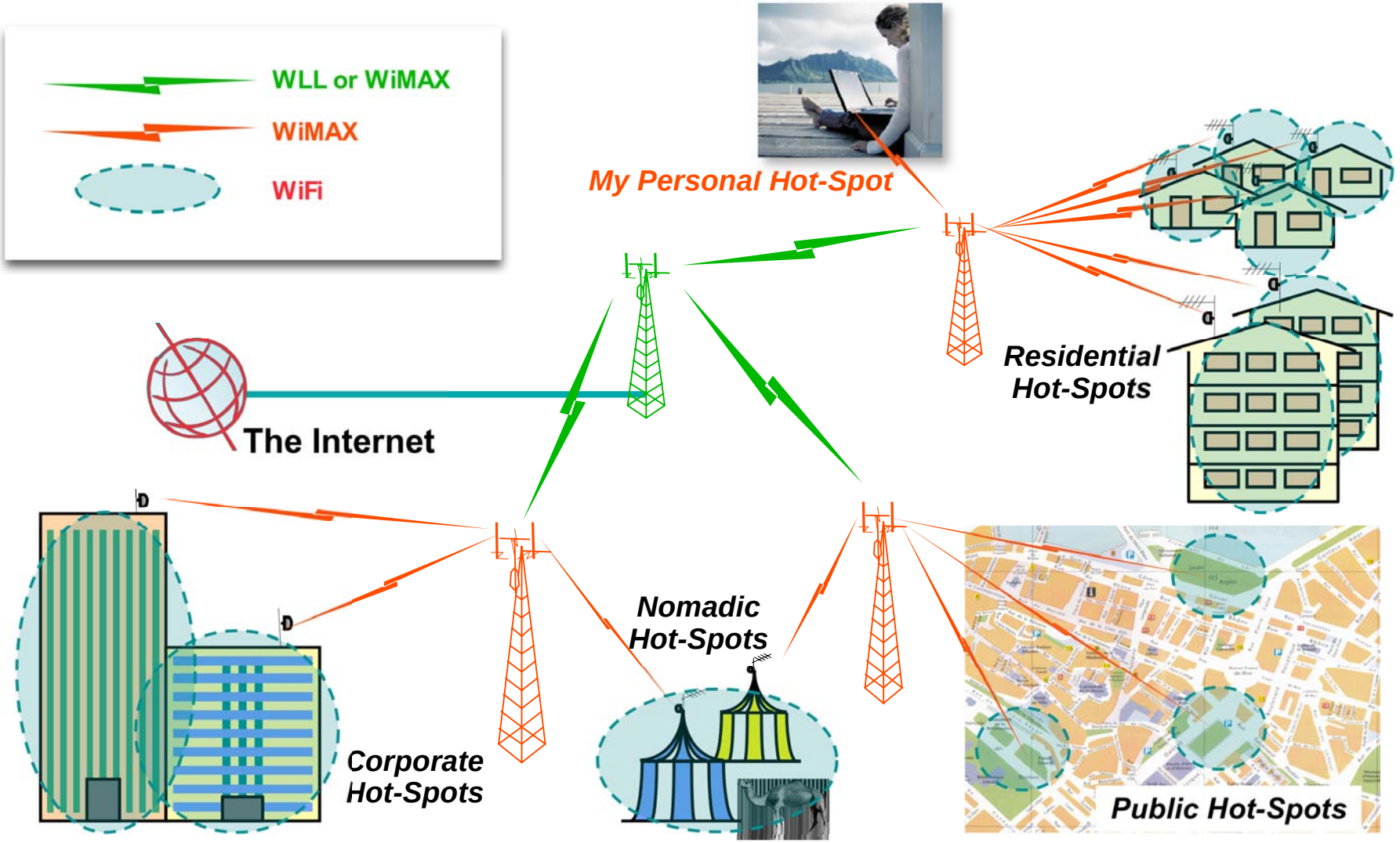

WiMAX and WiFi

DVB-T BB Wireless Return Channel

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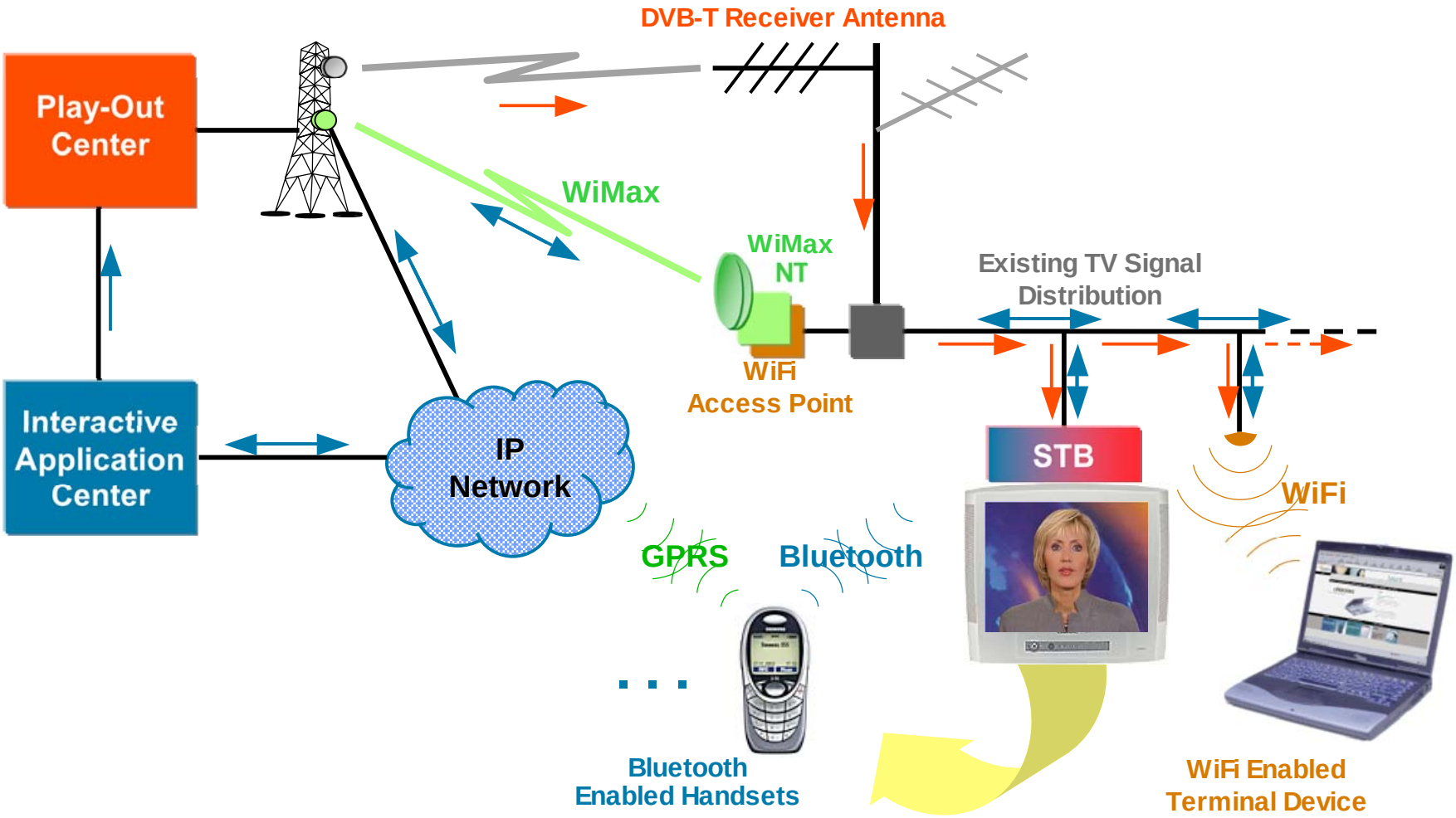

DVB-T

Reference Architecture

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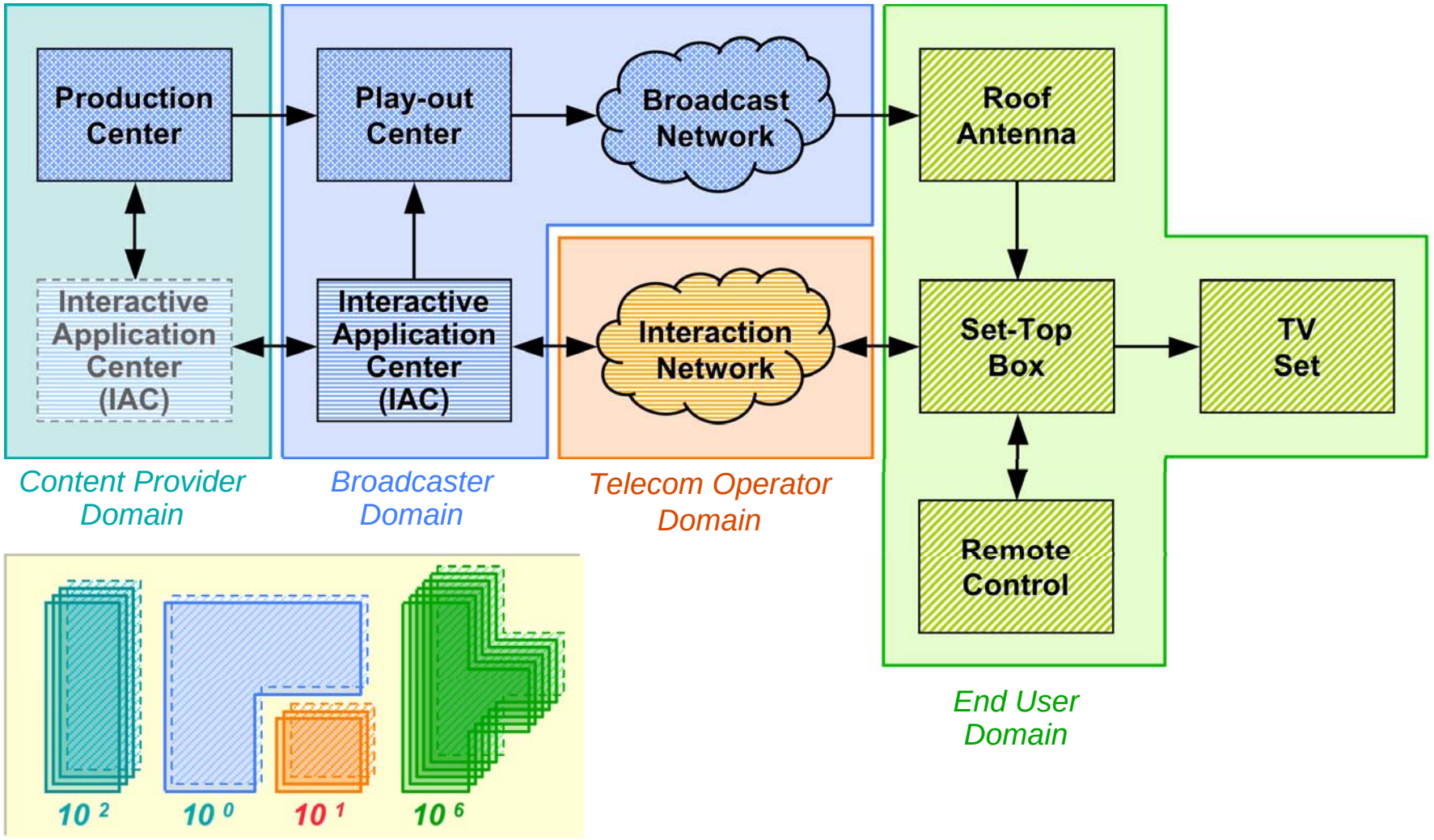

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IAC Access Alternatives

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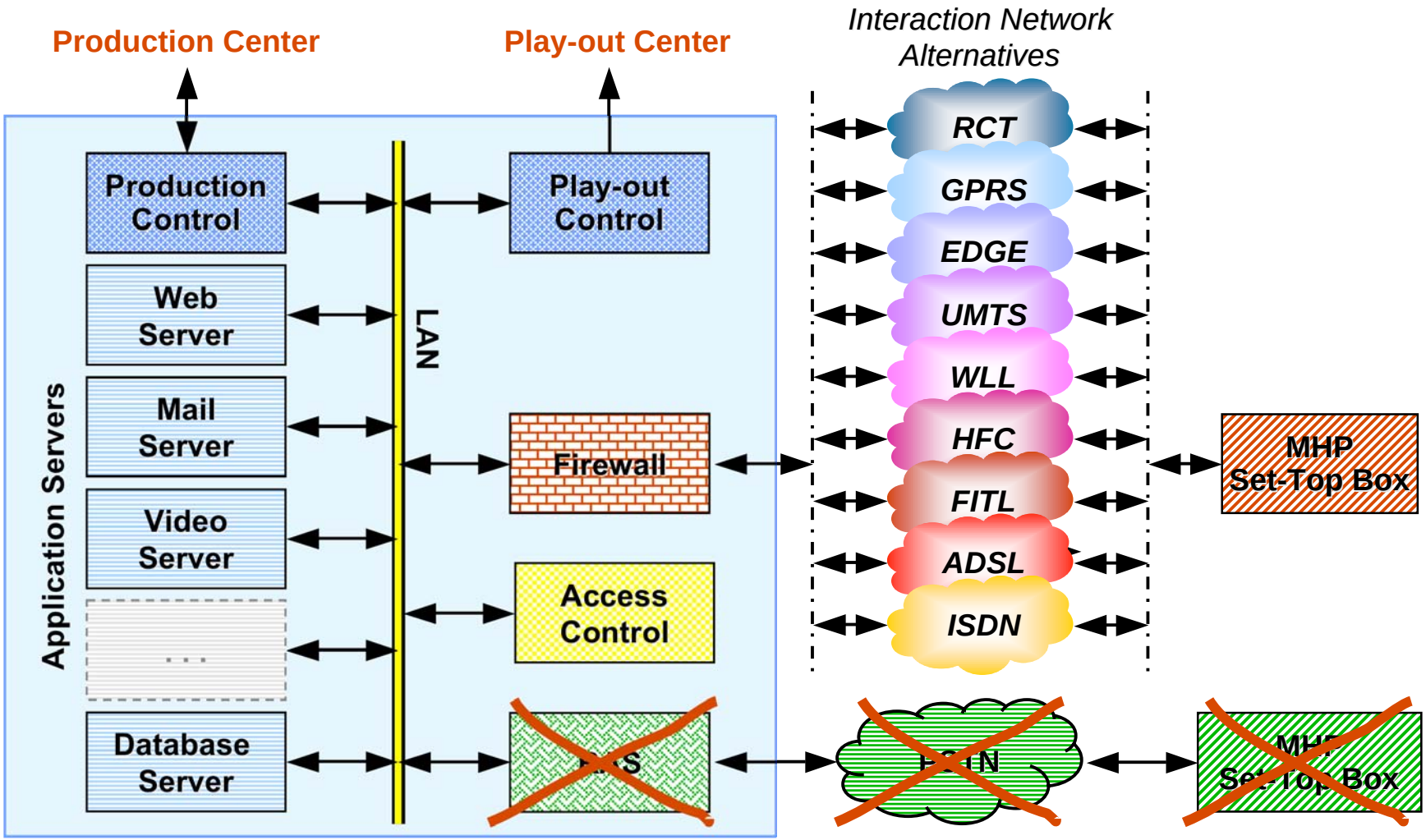

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IAC Access Management via IMS

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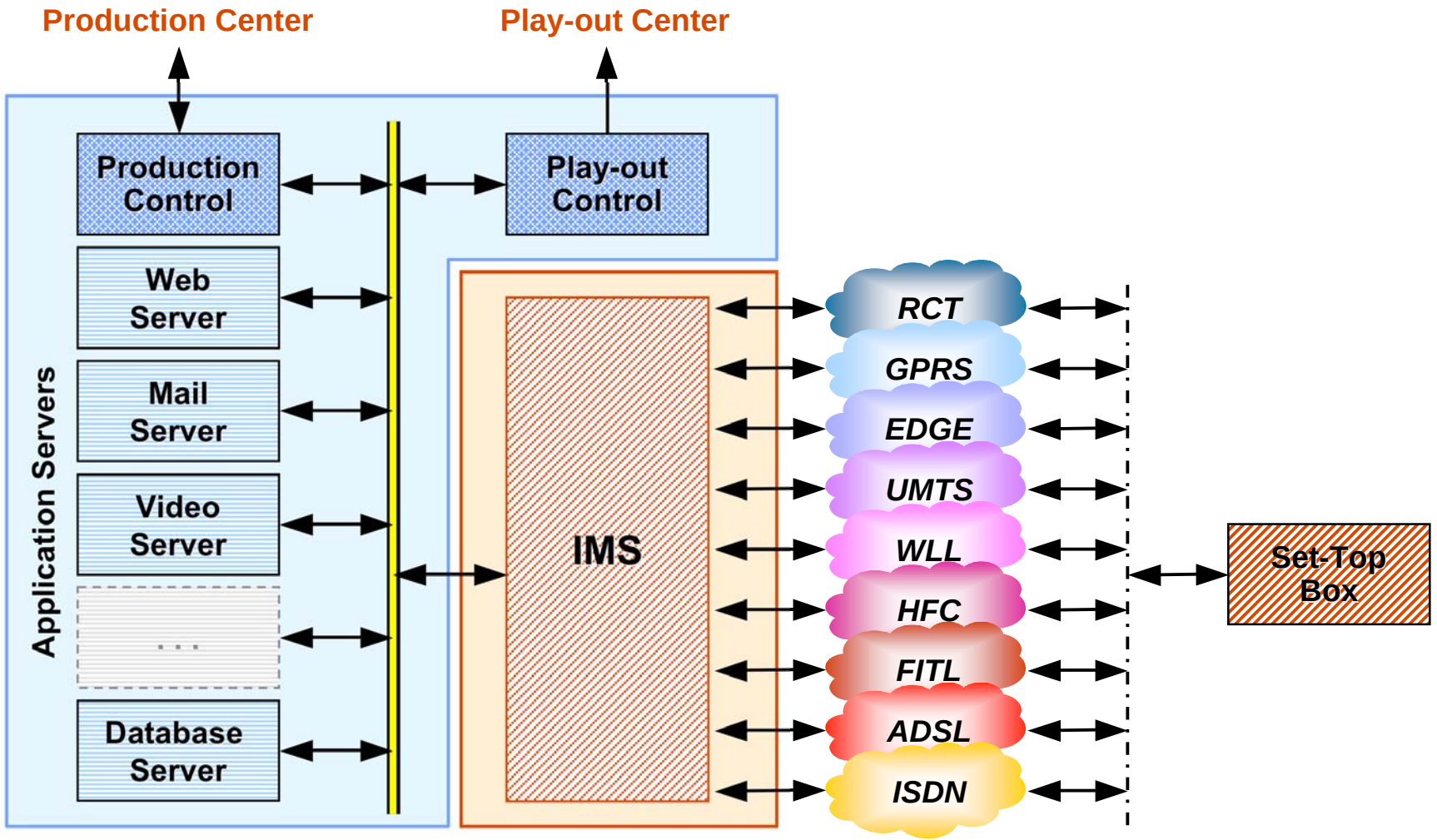

IMS

IP Multimedia Subsystem Architecture

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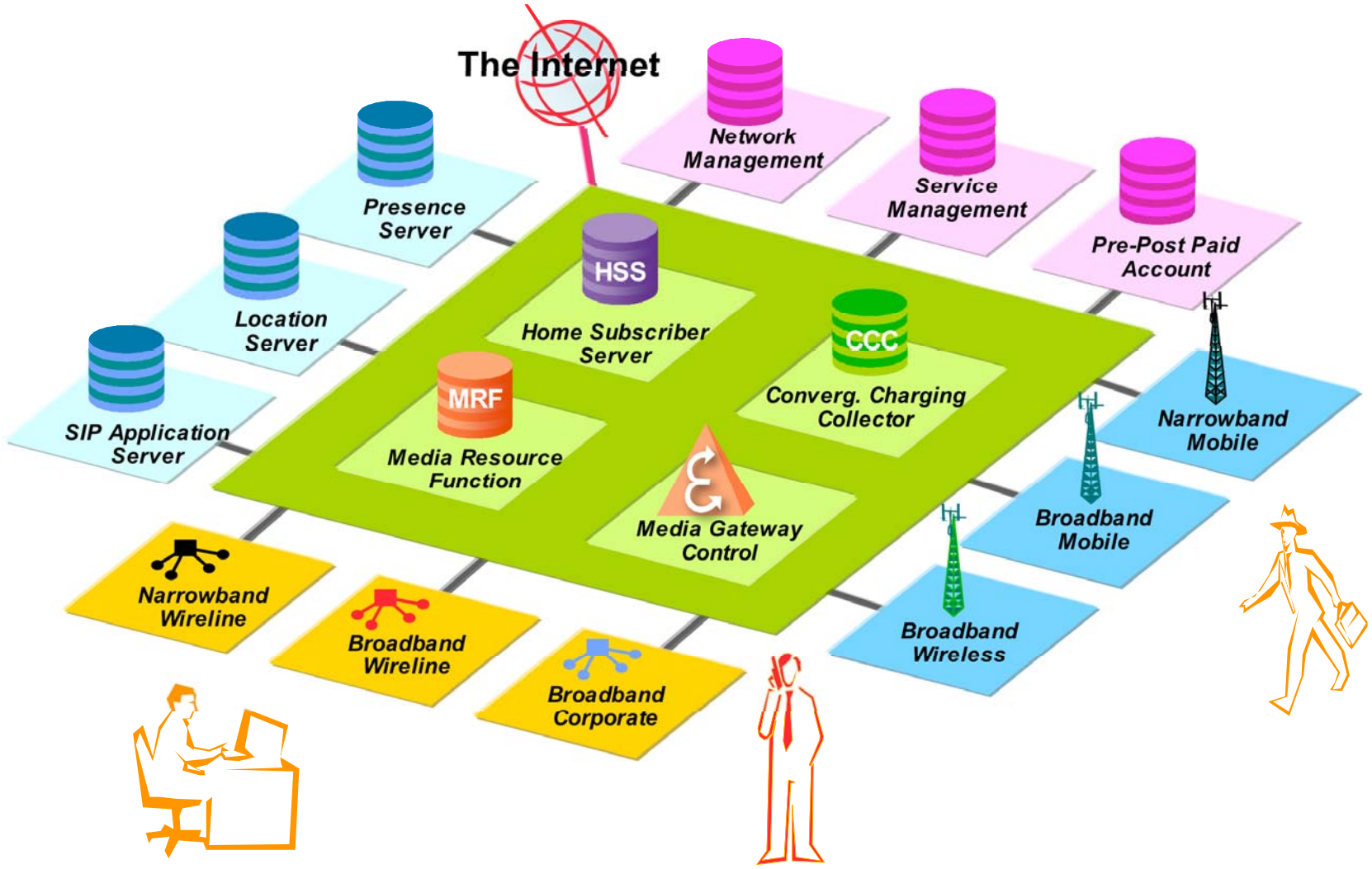

Conclusions

… for the Network/Equipment Designer

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Dependability remains a major requirement, but:

- No more need/chance to exactly match predefined standards via “standard” solutions
- Many more dependability aspects to deal with
- Added *(perceived)* value must always be *(provably)* higher than additional cost
- Simple, straight scalability definitely a plus
- Need to reconcile opposite trends and requirements *(e.g. fewer/larger fiber backbones with many differentiated wireless access solutions)*
- Effective management of diverse and legacy networks now a major issue

Conclusions

… for Customers and all End Users

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Much broader choice of Services, Service Providers and QoS levels, but:

- None comes for granted, none comes for free
- None will ever be absolutely better than all other
- Need to *(dynamically)* choose among all available alternatives *(or better have an "intelligent" terminal seamlessly choose for you)*
- Need to measure and assess which QoS is being paid for and which QoS is actually being delivered

Conclusions

… for the Application/Service Designer

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Broad choice of delivery networks and technologies, but:

- No single one will ever reach all potentially interested customers
- No two ones will ever look or behave alike
- Need to adapt/scale services to individual network and terminal characteristics
- Effective mediation middleware could indeed make the difference

Conclusion

… which networks in your next “cloud” ?

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