THIRD GENERATION BIRTH HISTORY

HEIKKI AHAVA
VICE PRESIDENT, NEW SYSTEM TECHNOLOGIES
NOKIA MOBILE PHONES

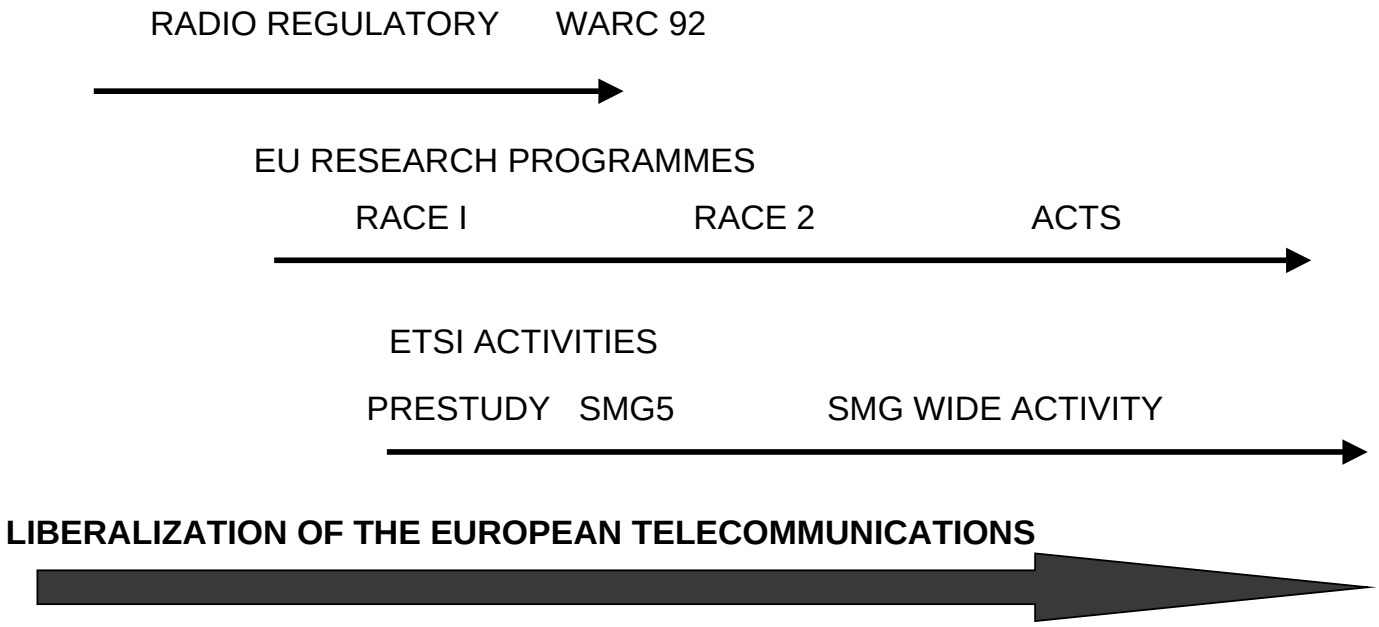
NOKIA

BACKGROUND

- I AM NOT TRYING TO PRESENT AN OBJECTIVE HISTORY BUT A PERSONAL STORY COVERING ABOUT A 10 YEAR PERIOD
- UNFORTUNATELY A LOT OF DOCUMENTS HAS DISAPPEARED AND I HAVE HAD MOSTLY TO TRUST MY OWN MEMORY AND DISCUSSIONS WITH MY COLLEAGUES
- THE WHOLE STORY CANNOT YET BE TOLD AS THE PROCESS IS NOT FINISHED AND SOME OF THE INFORMATION HAS BEEN RECEIVED IN CONFIDENCE
- THIS DOES NOT NECESSARILY REPRESENT NOKIA'S POSITION
- DURING 1988-91 I WAS EMPLOYED BY OY OMNITELE AB FOR 2.5 YEARS AND IN THAT TIME PERIOD I WAS NOT ACTIVE IN UMTS ISSUES

NOKIA

DIFFERENT TRACKS IN EUROPE



EARLY ACTIVITIES OUTSIDE EUROPE

- THE GOAL OF CCIR (LATER ITU-R) WAS TO STANDARDIZE A TOTALLY NEW GLOBAL SYSTEM. ORIGINALLY THIS WAS CALLED FPLMTS (FUTURE PUBLIC LAND MOBILE TELECOMMUNICATIONS SYSTEM). LATER IT WAS RENAMED AS IMT-2000. ITS NETWORK PART WAS SUPPOSED TO BE STANDARDIZED IN ITU-T. THE 2ND GENERATION SYSTEMS WERE STANDARDIZED BY REGIONAL ORGANIZATIONS (ETSI, TIA, RCR (ARIB), TTA…)
- THE ITU'S SUCCESS TO FIND A GLOBAL NEW FREQUENCY BAND BETWEEN 1900…2100MHz (SO CALLED FPLMTS BAND) WAS THE FOUNDATION FOR THE WHOLE 3RD GENERATION DEVELOPMENT. THIS DECISION WAS MADE IN THE WARC 1992 CONGRESS
- IN WARC 92 NORTH AMERICANS OPPOSED STRONGLY THE EARMARKING OF THE FPLMTS BAND. THEY WERE IN FAVOUR ALLOCATING SPECTRUM FOR "BIG LEO" MOBILE SATELLITES (IRIDIUM, GLOBALSTAR…). HOWEVER, FINALLY A COMPROMISE BETWEEN THE TERRESTRIAL CELLULAR SERVICES AND MOBILE SATELLITE SERVICES WAS ESTABLISHED

EARLY ACTIVITIES OUTSIDE EUROPE (2)

- THERE WERE ONLY FEW ACTIVITIES IN THE USA AND IN FACT THE US GOVERNMENT AUCTIONED A MAJOR PART OF THE FPLMTS BAND AND THE NEW OWNERS FILLED THE SPECTRUM WITH EVOLVED 2ND GENERATION SYSTEMS
- IN 1994 JAPAN INVITED INTERESTED PARTIES TO JOIN THEIR FPLMTS WORK. ITS GOAL WAS TO MAKE A SYSTEM PROPOSAL IN 1998 TO ITU-R. ALSO FOREIGN COMPANIES (e.g. NOKIA) JOINED THE PROGRAMME BUT THEIR PROFILE WAS VERY LOW IN EARLY YEARS.

RACE I PROGRAMME

- BEFORE RACE I WAS STARTED THERE WAS A PRESTUDY AND THIS PROPOSED TO INCLUDE MOBILE ORIENTED ACTIVITIES IN RACE
- MORE THAN 20 COMPANIES JOINED THE RACE MOBILE CONSORTIUM LEAD BY PHILIPS TO STUDY UMTS. IT WAS A REAL UPHILL STRUGGLE TO SET UP THIS PROJECT AS MOBILE BUSINESS WAS NOT RECOGNIZED AS PART OF THE BROADBAND ACTIVITIES AND THE RECOGNITION OF MOBILE COMMUNICATIONS WAS ALSO GENERALLY VERY LOW.
- THE BUDGET OF THE MOBILE PROJECT WAS CUT DOWN IN 1992 AND THEN CERTAIN CORE MEMBERS DECIDED TO SET UP A SYSTEM GROUP TO CONTINUE THE WORK
- THE FOLLOWING SLIDES ARE AN EXTRACT FROM A NOKIA INTERNAL RACE MOBILE PROJECT PRESENTATION

UNIVERSAL MOBILE TELECOMMUNICATIONS SYSTEM (UMTS)

- The key elements of UMTS
  - * A common standard for public cellular and private cordless systems with full interworking
  - * Very low cost personal terminals
  - * A mixture of public and private cells connected to the B-ISDN
  - * Optimal usage of the fixed network infrastructure
  - * High bit rate radio channels, a wide range of services

- Operational before the year 2000

- FPLMTS of CCIR
  (Future Public Land Mobile Telecommunication Systems)

PROJECT OBJECTIVES

- Integration of mobile services into one single system
  - * Paging
  - * Cordless telephones
  - * Cellular telephones
  - * A single handset may be used in the home, the office and outdoors in both city and rural locations

- Integration of mobile communications into the broadband telecommunications networks (B-ISDN)
  - * Extension of the broadband services into the mobile environment

- Influence the international standards on third generation mobile telecommunications systems (ETSI, CCITT, CCIR)

PROJECT STRUCTURE

- Divided into six Core Areas:

  Fixed Network
  * Network issues
  Cellular Coverage
  * Radio propagation and radio resource management
  Channel Management
  * Multiple access and multiplexing
  Modulation and Equalization
  * Modulation and equlization techniques, speech coding
  Broadband
  * Mobile broadband issues
  System Group
  * Technical co-ordination and lead

- Core Areas further subdivided into Work Packages

SYSTEMS GROUP

MAIN ACTIVITIES
- Put together a system (UMTS) from the results of the project
- Derive information relevant to UMTS from the output of the other Core Tasks
- Support the work of the other Core Tasks by helping to achieve a common view
- Guide the work of the other Core Tasks towards common targets
- Provide and coordinate input to the standards bodies (CCIR, CCITT, ETSI)
- Produce documents (EC Deliverables) on key system issues
- Studies on selected issues using "Flexible Effort"
-

INPUT TO THE STANDARDS BODIES
- Contributions to ETSI/RES ad-hoc UMTS
- Contributions to ETSI/SMG5 (UMTS)
  * Common Functional Specification (on mobile)
  * RACE UMTS Requirements Specification
- Establishment of strong relationship with CCIR TG8/1 (FPLMTS)
  * Visit of Mr. Callendar to PN (Chairman of TG8/1)
  * CCIR TG 8/1 welcomes contributions from RACE

ASSUMPTIONS ON TELECOMMUNICATIONS IN THE LATE 1990s

- Wide range of standards, systems and telecommunications capabilities will exist in the various countries
- ISDN will form a large part of the backbone infrastructure in some countries
- In some countries only a PSTN will exist
- In most countries ISDN and/or B-ISDN will not have penetrated the home environment
- B-ISDN standards near completion, in some countries may emerge along major trunk lines and major corporate users
- UPT will be available on all networks
- GSM 900 and DCS 1800 networks will be implemented across Europe and other countries (20 million users)
- GSM 900 and DCS 1800 not likely to become a de facto world-wide standard, alternative standards and frequency allocations in the US and Japan)
- Mobile call and equipment charges will be considerably higher than those of fixed networks
- DECT equipment will be widespread in European companies and beginning to be significant in the residential market
- Change in the types of teletraffic carried (more data traffic and new services like video conferencing)

NOKIA INTERNAL PRESENTATION DEC 91, EXTRACT

RACE II PROGRAMME

- THREE MAIN MOBILE PROJECTS
  - MONET

    MONET AUDIT PANEL COMMENT IN 1994:

    "There is a danger that MONET is evolving GSM and 2nd generation rather than being adventurous"

  - ATDMA, WIDEBAND TDMA TEST BED (SIEMENS, ALCATEL, NOKIA….)
  - CODIT, WIDEBAND CDMA TEST BED (PHILIPS, ERICSSON, BT….)

    THIS PROJECT SUFFERED STRONGLY WHEN PHILIPS PULLED BACK COMPLETELY FROM THE PROJECT. ALTHOUGH THE END WAS VERY PAINFUL FOR ERICSSON THEY WERE LATER ABLE TO UTILIZE THE RESULTS IN THE JAPAN FPLMTS WORK AND ALSO FOR DEMONSTARTION PURPOSES.
  - THE COMPARISON OF CODIT AND ATDMA RESULTS DID NOT GIVE A CLEAR GUIDANCE ON THE TDMA vs CDMA DUEL FUELLED BY THE HEATED DEBATE IN THE USA

MONET PROJECT OBJECTIVES

- Specify and evaluate the mobile functions and relevant protocols of third generation mobile telecommunication systems that will support a wide range of mobile services to the users

- Define a fixed infrastructure for third generation mobile telecommunications systems as integrated part of IBCN to enhance the effective use of future network resources and that can also be used as a stand-alone network (eg connected to N-ISDN)

- Define a network architecture for third generation mobile telecommunication systems in such a way that user terminals can be used anywhere in the public, business domestic and vehicle environments and that it allows evolutionary growth

Contribute to standard bodies and Common Functional Specification (CFS) of IBCN, focusing on the network aspects of mobility in third generation mobile telecommunication system.

- Prove the feasibility of the network architecture by simulations and evaluate the mobility procedures

NOKIA INTERNAL PRESENTATION DEC 91, EXTRACT

ATDMA TEST BED

- PROVED THAT THE UMTS REQUIREMENTS CAN BE IMPLEMENTED WITH WIDE BAND TDMA SYSTEMS
- QUOTE FROM AN INTERNAL REPORT "CO-OPERATION WAS A HARD EXPERIENCE"
- ACHIEVEMENTS
  - PACKET RADIO MULTIPLE ACCESS IN THE UPLINK USED FOR SPEECH AND DATA
  - ADAPTIVE CHANNEL CODING
  - FAST POWER CONTROL
  - DYNAMIC CHANNEL ALLOCATION
  - HIERARCHICAL CELL STRUCTURES

ACTS PROGRAMME, FRAMES PROJECT

- FRAMES WAS ESTABLISHED MAINLY BY SIEMENS AND NOKIA. ERICSSON WAS INITIALLY RELUCTANT TO JOIN DUE TO THE PROBLEMS IN THE LATE PHASES OF CODIT
- FRAMES IS ONE OF THE BIGGEST EU FUNDED TELECOMMUNICATION RESEARCH PROJECTS
- THE PURPOSE WAS TO FIND A JOINT ERICSSON, NOKIA, SIEMENS PROPOSAL FOR ETSI'S UMTS SYSTEM SELECTION
- ALTHOUGH THE ULTIMATE GOAL WAS NOT ACHIEVED FRAMES SUPPLIED THE MAJORITY OF THE TECHNICAL CONTENT TO THE ETSI UMTS SYSTEM SELECTION PROCESS
- FRAMES ALSO OFFERED A FORUM WHERE THE COMPETING MANUFACTURERS COULD COME AND TALK

FRAMES PROPOSAL PRESENTATION TO SMG2 DEC 96, EXTRACT

Presentation of the FRAMES Multiple Access Scheme - FMA

SMG2 UMTS Workshop on December 16 and 17, 1996

- CSEM/ProTelecom
- Ericsson
- France Telecom
- Nokia
- Siemens

FRAMES - Future Radio Wideband Multiple Access System

- Siemens AG (P)
- Roke Manor Research Ltd (S)
- Ericsson Radio Systems AB (P)
- Nokia Corporation (P)
- Technical University of Delft (P)
- University of Oulu (P)
- Centre National d Etudes des Telecommunications (P)
- Centre Suisse d Electronique et de Microtechnique SA (P)
- Eidgenössische Technische Hochschule TH Zurich (S)
- University of Kaiserslautern (P)
- Chalmers University of Technology AB (P)
- The Royal Institute of Technology (P)
- Instituto Superior Tecnico (P)
- Integracion y Sistemas de Medida SA (P)

FRAMES PROPOSAL PRESENTATION TO SMG2 DEC 96, EXTRACT

Goals of FRAMES

- To define, develop and evaluate a hybrid multiple access scheme from a large number of technology candidates for the UMTS wideband radio interface.
- To define a UMTS multiple access air interface specification, which will serve as an input towards the UMTS standardisation process.
- To investigate related mobility management aspects.
- To build a demonstrator which will be used to validate basic functionality required to justify the FRAMES specification and to trial appropriate application from a different ACTS project.
- To submit technical contributions to ETSI and other standards bodies with a view to securing acceptance of the FRAMES specification as a consensus standard for UMTS.

FRAMES PROPOSAL PRESENTATION TO SMG2 DEC 96, EXTRACT

FRAMES MULTIPLE ACCESS SCHEME

FMA

FMA - Frames Multiple Access

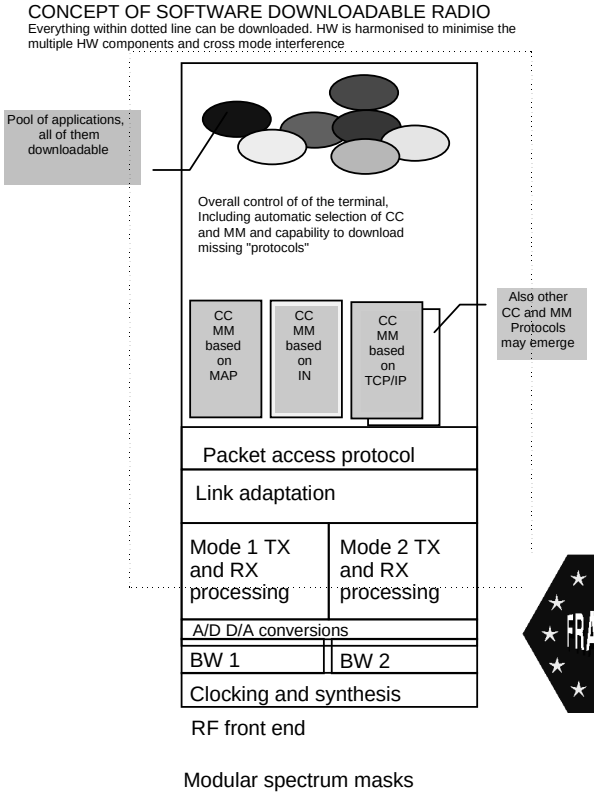
- FMA combines TDMA and CDMA techniques into one harmonized platform
- Mode 1: wideband TDMA/CDMA with and without spreading feature
  - bandwidth 1.6 MHz or 3.2 MHz
  - wideband TDMA specially optimized for wideband packet data services in low and medium tier environment
- Mode 2: wideband CDMA
  - bandwidth 6.4 MHz or 12.8 MHz
- FMA is defined to cope with all possible UMTS scenarios

FRAMES PROPOSAL PRESENTATION TO SMG2 DEC 96, EXTRACT

FMA platform - harmonized approach

- harmonized control, packet access and adaptation protocols
- separate RX/TX processing implemented on baseband SW
- RF parameters harmonized for easy implementation and co-existence

FRAMES PROPOSAL PRESENTATION TO SMG2 DEC 96, EXTRACT



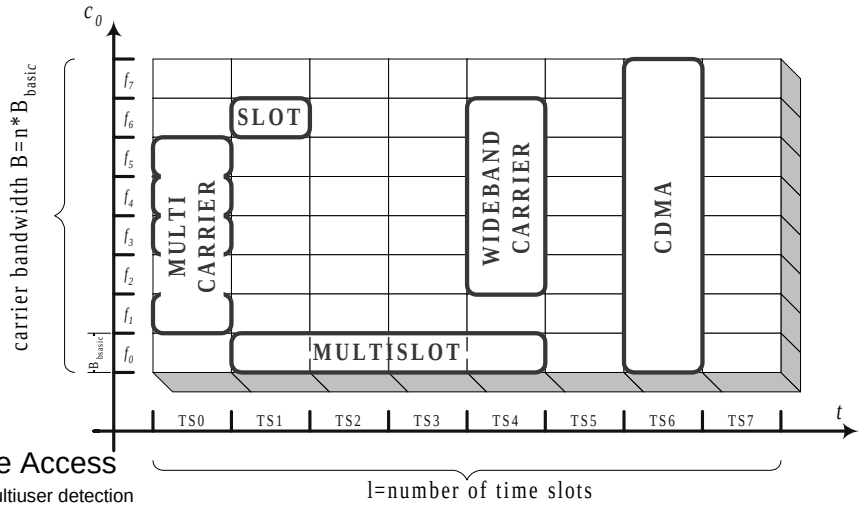
FMA platform - Main features

	Mode 1: WB-TDMA/CDMA	Mode 2: WB-CDMA
Multiple-access method	TDMA/CDMA	Direct-Sequence CDMA
Channel spacing	1.6 MHz or 3.2 MHz	6.4 MHz or 12.8 MHz
Carrier chip/bit rate	1.55 - 4.74 Mbit/s or Mchip/s	5.2 Mchips/s
Duplex method	FDD and TDD	FDD only
Interference reduction	Both intra and intercell with joint detection	Only intra cell with multiuser detection in the uplink
Spreading codes	Orthogonal spreading codes of length 16 chips	Short codes from 2 chips up to 512 chips
Multirate concept	DL & UL: Multislot and Multicode	DL: Multicode UL: Variable spreading
Detection	Coherent, based on Midamble	DL: Coherent detection (pilot-code based) UL: Coherent detection (reference-symbol-based)
Handover	Mobile assisted	Mobile controlled soft handover
Interfrequency handover	Supported	Supported
Frequency hopping	Frame-by-frame/slot-by-slot	N/A

FRAMES PROPOSAL PRESENTATION TO SMG2 DEC 96, EXTRACT

SMA and CATS

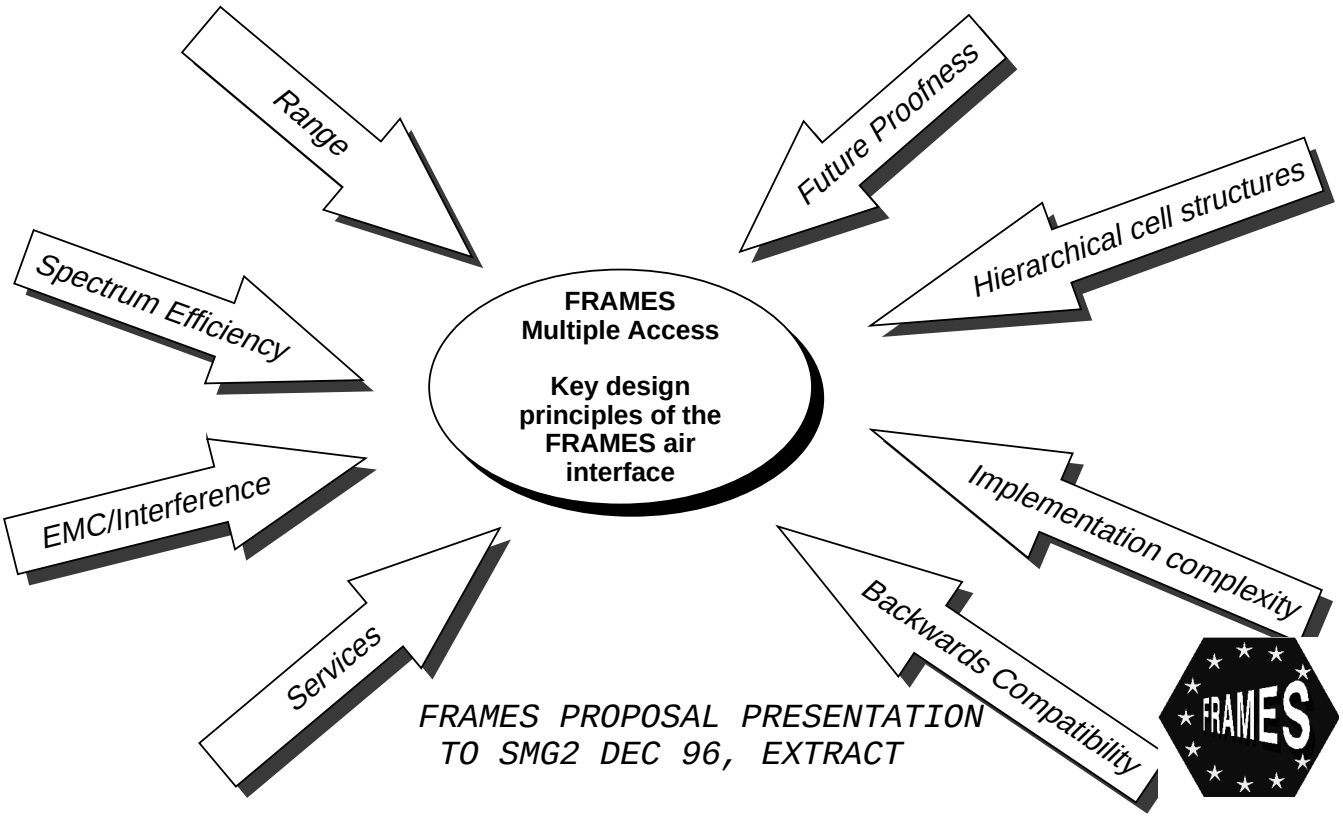
- SMA - Slotted Multiple Access
  - SMA1 - multicarrier TDMA
  - SMA2 - single carrier TDMA
  - SMA3 - slotted CDMA



- CATS - Code and Time Division Multiple Access
  - CATS1 - asynchronous wideband CDMA based on multiuser detection
  - CATS2 - spread OFDM (downlink only)
  - CATS3 - synchronous CDMA

FRAMES PROPOSAL PRESENTATION TO SMG2 DEC 96, EXTRACT

Evaluation Criteria



FRAMES PROPOSAL PRESENTATION TO SMG2 DEC 96, EXTRACT

Evaluation conclusions - schemes for further study

- SMA2 (WB-TDMA)
  - flexible for TDD with asymmetric services
  - optimized for high bit rate services
  - equalizer complex in large cells
- SMA3 (WB-TDMA with spreading)
  - good performance both for voice and data
  - spreading makes delay spread handling easier
  - high complexity due to joint detection for low bit rate services
- CATS1 (WB-CDMA)
  - flexible for circuit switched variable rate services
  - requires large chunks of spectrum
  - not good for asymmetric services in TDD mode

FRAMES PROPOSAL PRESENTATION TO SMG2 DEC 96, EXTRACT

⇒Combine SMA2 and 3

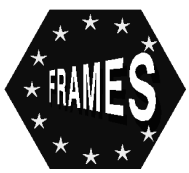
⇒harmonize CATS1 parameters with SMA2 and 3

NOKIA

Reasoning for two modes

- Both modes can in principle fulfill UMTS criteria
- Different modes show different advantages and disadvantages depending on the radio and service requirements
- Mode 1
  - more flexible to bursty and asymmetric service requirements
  - suits well both for FDD and TDD operation
- Mode 2
  - more suited for moderately variable bit rate services for FDD and licensed spectrum

FRAMES PROPOSAL PRESENTATION TO SMG2 DEC 96, EXTRACT



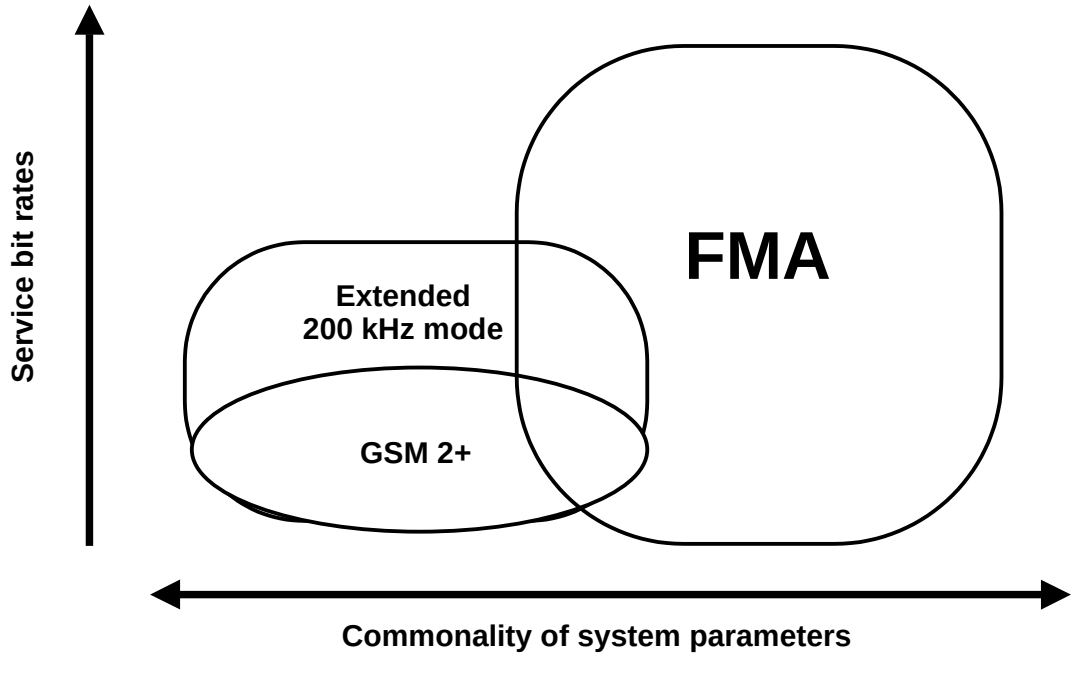
NOKIA

Evolution of 200 kHz GSM

- Based on 8-slot TDMA with new modulation
- An evolved 200 kHz mode can offer higher data rates
  - 150-200 kbit/s with binary modulation
  - 300-400 kbit/s with quaternary modulation
- FRAMES has evaluated a 200 kHz mode as “SMA1” Advantages are:
  - Can co-exist on GSM carriers - Easy evolution
  - Easy dual mode terminals implementation
  - Well harmonised with GSM *and* FMA
  - Low spectrum granularity - Efficient with HCS
- 200 kHz carrier is not studied further within FRAMES

FRAMES PROPOSAL PRESENTATION TO SMG2 DEC 96, EXTRACT

Harmonisation of GSM and FMA

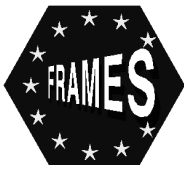


FRAMES PROPOSAL PRESENTATION TO SMG2 DEC 96, EXTRACT

Conclusions

- FMA multiple access defined as platform for UMTS
- FMA is proposal for a harmonized open global standard
- FRAMES has carried out an extensive multiple access comparison
- Both Modes of FMA platform can fulfill UMTS targets. For a specific market and operator scenario either Mode 1 or Mode 2 has advantages over the other from technical point of view.

FRAMES PROPOSAL PRESENTATION TO SMG2 DEC 96, EXTRACT



Early years of the 3rd G standardization

- ITU:
  - REGULATOR AND "OLD PTT" DOMINATED ENVIRONMENT
  - WEAK LINKS TO BUSINESS COMMUNITY
  - JAPANESE MOST ACTIVE
  - LOOKING FOR ATOTALLY NEW CONCEPT, NO EVOLUTION REQUIRED
- ETSI
  - SMG5 CONTROLLED BY NON-CELLULAR INTEREST GROUPS
  - GSM EVOLUTION IS PRACTICALLY FORBIDDEN
  - TOTALLY NEW SYSTEM BASED ON B-ISDN CONCEPTS
  - STRONG INVOLVEMENT FROM RACE PROJECTS
- JAPAN
  - LOOKING FOR BETTER SUCCESS THAN IN THE 1st AND 2nd GENERATION
- USA
  - NO INTEREST AT ALL

THE DIRECTION OF SMG5 IS CHANGED

- NOKIA INTERNAL ACTIVITIES IN THE 3rd G GET STRONGER AND THE GOALS OF SMG5 AND ITU TG8/1 RECEIVE STRONG CRITICS. NOKIA UNDERSTOOD IN 1992…1995 THAT GSM WILL BECOME THE WORLD'S LARGEST DIGITAL STANDARD WITH A HUGE CUSTOMER BASE.
- NOKIA CONCLUDED THAT THERE MUST BE CONSTANT EVOLUTION OF THE GSM STANDARD LEADING TO THE UMTS STANDARD:
  - EVOLUTION IN SERVICES
  - EVOLUTION IN CORE NETWORKS
  - **REVOLUTION** IN THE AIR INTERFACE
- THIS MESSAGE WAS FIRST COMMUNICATED TO THE GSM STANDARDIZATION GROUPS AND LATER IT WAS ACCEPTED IN ETSI TC SMG
- OTHER MANUFACTURERS CAME TO SUPPORT THE IDEA, ESPECIALLY ERICSSON. THERE WAS NO FORMAL CO-OPERATION IN THIS ACTIVITY; BOTH COMPANIES HAD COME TO THE SAME CONCLUSION IN THEIR LONG TERM STRATEGIES
- JUHA RAPELI WAS ELECTED THE SMG5 CHAIRMAN, AND THEN IT ALL STARTED TO CHANGE

GSM EVOLUTION BECOMES ACCEPTED

- THE CEC INVITED KEY PLAYERS TO DISCUSS AND AGREE ON STRATEGIC GOALS OF UMTS, THE UMTS TASK FORCE IS FORMED
- THE TASK FORCE PRODUCES A REPORT SUPPORTING THE GSM EVOLUTION AND PROPOSES THAT AN UMTS FORUM MUST BE ESTABLISHED
- THE START OF THE FORUM IS A ROCKY ROAD AND A LOT OF TIME IS WASTED UNTIL IT STARTS ITS WORK
- MEANWHILE THE GOALS OF SMG5 WERE CHANGED, GSM EVOLUTION TO UMTS IS DEFINED AS THE FUTURE STRATEGY
- GSM MoU SUPPORTS THE EVOLUTION
- THERE IS STILL RESISTANCE IN ETSI, OUTSIDE OF SMG. THE FIXED NETWORK OPERATORS DO NOT LIKE THE TREND AS THEY EXPECTED TO HAVE AN INTEGRATION OF ALL TELECOM SERVICES.
- GLOBAL MOBILE MULTIMEDIA ACTIVITY IS STARTED, "THE EMPIRE STRIKES BACK"
- HOWEVER, THE FINAL OUTCOME OF GMM WAS ACCEPTABLE: SEVERAL APPROACHES TO THE 3rd G WERE RECOGNIZED AND ACCEPTED. THE MOBILE AND FIXED NETWORK GROUPS WERE ALLOWED TO DO THEIR OWN APPROACH TO 3G

APPROACHING THE UTRA SELECTION

- SMG5 IS DISSOLVED AND ALL SMG STCs START WORKING ON UMTS
- THE ITU GOALS ARE CHANGED: ITU TG8/1 IS NOT GOING TO STANDARDIZE IMT 2000 BUT IT WILL DO AN EVALUATION OF SYSTEMS PROPOSED BY REGIONAL STANDARDS BODIES. THIS WAS PUSHED HARD BY EUROPEANS AND AMERICANS. ITU ACCEPTS THE FAMILY CONCEPT OF SYSTEMS: THIS LEAVES THE DOOR OPEN TO THE EVOLUTION OF BOTH GSM AND IS 41 NETWORK PROTOCOLS AND PRACTICALLY CLOSES THE PROGRESS TOWARDS A NEW B-ISDN BASED NETWORK
- FRAMES PROJECT PRESENTS PUBLICLY ITS RESULTS IN DECEMBER 1996: FMA CONCEPT
- AS FRAMES IS NOT ABLE TO AGREE ON A SINGLE SYSTEM, FMA IS PROPOSED ALSO TO THE FINAL UTRA SELECTION IN MARCH 1997
- AMERICANS DO NOT PROPOSE ANY SYSTEM TO ETSI, SONY PROPOSES OFDMA
- MEANWHILE THE JAPANESE FPLMTS COMMITTEE HAS CHOSEN WCDMA
- NOKIA AND ERICSSON WERE CHOSEN AS SUPPLIERS TO THE NTT DoCoMo VALIDATION PROJECT

THE REAL BATTLE STARTS IN EUROPE

- IN SPRING 1997 FRAMES CONTINUES ITS WORK SUPPORTING THE ETSI SYSTEM SELECTION WORK
- BEHIND THE CURTAINS NOKIA, ERICSSON AND SIEMENS TRY TO FIND A COMMON SOLUTION ON TECHNICAL GROUNDS. THE LAST "FRIENDLY" TECHNICAL DISCUSSIONS ARE HELD IN JULY 1997.
- IN AUGUST ALCATEL, NORTEL AND SIEMENS ANNOUNCE THAT THEY HAVE ESTABLISHED A CONSORTIUM TO SUPPORT THE TD-CDMA SYSTEM. THIS WAS A SURPRISE FOR NOKIA AND ERICSSON.
- LATER MORE MANUFACTURERS JOIN THE CONSORTIUM: MOTOROLA, SONY, BOSCH…
- FINALLY IT WAS A CLEAR BATTLE BETWEEN NOKIA, ERICSSON vs ALL OTHER MANUFACTURERS. (LUCENT AND QUALCOMM STAY NEUTRAL). THE ITALIAN OPERATOR TIM GIVES US OPEN SUPPORT. NTT DoCoMo IS, OF COURSE, ON OUR SIDE BUT THEY ARE REGARDED AS AN OUTSIDER.
- OTHER JAPANESE MANUFACTURERS (NEC, PANASONIC…) COME TO SUPPORT WCDMA BUT THEIR PUBLIC ROLE IS KEPT LOW
- REAL TECHNICAL DISCUSSIONS ARE OVER AND NOW THE POLITICAL GOALS DOMINATE THE ARGUMENTS

MANUFACTURERS FIGHT, EUROPEAN OPERATORS ARE TOTALLY CONFUSED

- OPERATORS RECEIVE TOTALLY CONTRADICTORY INFORMATION FROM WCDMA AND TD-CDMAIN CAMPS IN VARIOUS WORKSHOPS AND MEETINGS
- FINALLY SOME OPERATORS SAY THAT THEY DO NOT WANT TO LISTEN THE CONFLICTING ARGUMENTS ANY MORE
- ONLY OPERATORS IN APAC ARE OPENLY SUPPORTING US BUT THEIR SUPPORT DOES NOT HELP MUCH AS MOST OF THEM CANNOT VOTE IN ETSI. FRENCH AND GERMANS HAD IN THE GA BLOCKED THE CHANGE OF THE ARTICLES OF ASSOCIATION OF ETSI TO EXPAND VOTING RIGHTS
- OCTOBER AND EARLY NOVEMBER ARE RATHER DEPRESSIVE FROM NOKIA'S AND ERICSSON'S VIEWPOINT
- IN LATE NOVEMBER AND EARLY DECEMBER OPERATORS HAVE FINALLY DECIDED THEIR POSITIONS AND COME TO SUPPORT US. ESPECIALLY THE WIDE SUPPORT FROM THE UK HAS TREMENDOUS EFFECTS GLOBALLY. AFTER THIS CHANGE IT WAS EVIDENT THAT WE WILL WIN!
- THE FIRST VOTING IN MADRID WILL NOT RESOLVE THE ISSUE AS IT IS ARRANGED ONLY FOR INDICATIVE PURPOSES
- WHEN GOING TO MADRID WE KNEW THAT WE HAVE MAJORITY BUT ALSO THAT WE ARE FAR FROM THE REQUIRED 71%

IT WAS A GLOBAL GAME

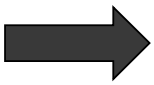
- AN ESSENTIAL ELEMENT WAS THAT THIS GAME WAS PLAYED GLOBALLY ALTHOUGH WE WERE DEALING WITH AN ETSI DECISION
- WE STARTED THE DAY WITH EURO-JAPANESE COMMUNICATIONS, AT DAY TIME IT WAS AN INTERNAL EUROPEAN AFFAIR AND IN THE EVENINGS WE CONTNUED LATE WITH TELEPHONE AND EMAIL MESSAGING WITH THE USA.
- ACTIVITIES IN ASIA AND THE USA HAD A DIRECT INFLUENCE TO THE SELECTION PROCESS
- ALTHOUGH THE NEW EURO-JAPANESE CO-OPERATION AND OUR ACHIEVEMENT TO EXPORT GSM EVOLUTION TO JAPAN WAS A REAL VICTORY IT WAS ALSO A SENSITIVE ISSUE
- ERICSSON AND NOKIA WERE ATTACKED THAT WE OPENED THE EUROPEAN MARKETS FOR THE JAPANESE INDUSTRY. WE REPLIED SAYING THAT SUCH CLAIMS ARE BASED ON THE OLD "FORTRESS EUROPE" THINKING WHICH DOES NOT A HAVE A PLACE IN THE GLOBAL COMPETITION WHICH WE HAVE TO MEET ANYWAY

SMG#24 IN MADRID

- THE DUEL CONTINUES IN MADRID
- VOTING IS IMPORTANT FOR BOTH SIDES IN ORDER TO "MEASURE THE TEMPERATURE" AND TO REFOCUS THE LOBBYING EFFORTS FOR THE SMG#24bis MEETING IN PARIS
- NOBODY EXPECTS A SOLUTION FROM THIS MEETING
- FRANCE TELECOM IS THE ONLY OPERATOR WHO OPENLY SUPPORTS THE TD-CDMA AIR-INTERFACE
- RESULTS OF THE INDICATIVE VOTE
  - 58.4% FOR WCDMA
  - 41.6% FOR TD-CDMA
  - 1392 WEIGHTED VOTES GIVEN INCLUDING 167 WHICH ABSTAINED

SMG#24bis IN PARIS

- BOTH CAMPS CONTINUED HEAVY LOBBYING BETWEEN THE MEETINGS
- SAME ARGUMENTS WERE REPEATED AS IN MADRID
- QUALCOMM SLIGHTLY CONFUSED THE MEETING WITH THEIR IPR LETTERS
- RESULTS OF THE 2ND VOTE:
  - WCDMA 61.1%
  - TDCDMA 38.1%
  - 163 VOTES ABSTAINED. TOTALLY 1523 VOTES PRESENT, 198 MEMBERS



WINNING BY VOTING IS PRACTICALLY IMPOSSIBLE

- AFTER THE VOTE BOTH CAMPS WENT TO THEIR OWN MEETINGS
- DURING THE EVENING MANUFACTURERS AGREED ON A COMPROMISE
- NEXT MORNING ALL KEY OPERATORS SIGNED THE AGREEMENT AS WELL AND FINALLY THE DECISION WAS MADE UNANIMOUSLY
- **NOKIA AND ERICSSON WERE THE WINNERS**